Pit and Quarry

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CEMENT · LIME · GYPSUM

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Pit and Quarry

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PSYCHOLOGY APPLIED TO INDUSTRY

PSYCHOLOGY is a subject which is usually thought of as quite out of place in practical discussions. Only the student or the theorist should concern himself with so abstract a term. This attitude is now, however, becoming as old-fashioned as the horse and buggy or the hand loom. The study of the mind has become an integral phase of practical business procedure, and systematic efforts are being made to apply the experimental results of psychology to the needs of society. The work of the other sciences was recognized far more speedily than that of the psychologists. The experiments of chemists and physicists, of physiologists and pathologists were quickly utilized in industry, in medicine, in agriculture, in mining, and in transportation. There is, of course, as great a field for practical application of the science of the mind. The fundamental laws of the ideas, of the attention, of the memory, and of the emotions has been elaborated. Furthermore, applied phychology has made a study of individual differences, of personalities whose mental life is characterized by particular traits of nationality, of race, of sex, age, special interests, or other features in which individuals differ. The value of this science is not in solving abstract economic problems, but in determining on the course of action which will get results. If you wish to accomplish certain things, you must proceed in a certain way. It is in this practical way that psychology is useful to industry.

There are two problems which are of greatest importance to every producer; equipment and workmen. Markets, advertising, sales promotion, cost accounting, all are a little less important than these two. Of the two, the problem of the employees is the more uncertain and difficult. Reputable manufactuers will stand back of their machinery, but the producer must depend upon himself to handle his men. The qualities of workmen involve mental dispositions, habitual traits of the personality, features of individual temperament and character, of intelligence and ability, of collected knowledge and of acquired experience. All phases of psychology are involved here, such as variations of will and feeling, of perception and thought, of attention and emotion, and of memory and imagination. The executive who can select his employees on the basis of their fitness for the tasks will prevent failures among the men. This prevention of failure is important. If a man fails in his work, he becomes a burden to himself and to society and an expense to the employer who has attempted to utilize his efforts. The laborer who is useless on one machine often does satisfactory work on another part of the operation where a different type of mental reaction is involved. He can adjust himself to one kind of labor and not to the other. Industry pays for the error of failures through excessive labor turnover and inadequate production.

Selecting men for the jobs, training them to work with the greatest efficiency, and making necessary adjustments in order that each man may do that work for which he is best suited are the preliminary steps in organization. Everything which diminishes and decreases efficiency must be eliminated; everything which reinforces efficiency must be utilized. No part of the industrial process is inconsequential; even the apparently trivial activity, the movement of arm or hand or leg, must become the object of study. No machine can survive in the struggle for technical existence unless it is adapted to the nerve and muscle of a human being, to a man's possibilities of perception, of attention, of memory, of feeling, and of will. Industry demands all available conditions of work which will make it possible for the workman to secure equal results with smaller effort, or to secure greater results with equal effort. There has been a tendency in industry to transpose activities from the large muscles to the small muscles. An activity which was formerly performed with the shoulder muscle is now done with the lower arm or perhaps with the hand. The whole history of machinery demonstrates this economic tendency to make activities dependent upon those muscles which require the smallest psychophysical effort. Machines have been transformed in the direction of securing the greatest help from the natural coordination of bodily movements, and as a result the muscle movements have become rhythmical. All rhythm involves a repetition of movement with little effort, eliminating fatigue and securing maximum habitual motion which is creative to a maximum degree.

An example of this scientific study of the operation can be found in shoveling. There is a possibility of great economic waste in shoveling. If the burden is too heavy, rapid fatigue follows and movements become slow; if the burden is too light, the greater part of the man's energy is not used.

Both conditions are conducive to waste. The solution is to determine on the weight which, with well arranged pauses, will secure maximum production without undue fatigue. Shovels must be secured which are suitable for the material to be handled. This means an exact determination of the most favorable rapidity and the most satisfactory rhythm of movement. In one case where this study was made, the result was that one hundred forty men could do the work which had required five hundred men. The man who formerly had shoveled sixteen tons of material could manage fifty-nine tons with no increase in fatigue. Wages were increased by two-thirds, and expense for shoveling was decreased one-half.

Applied psychology has proved that lack of attention brings decrease in the product of labor. The one activity involved in the operation must hold the workman's entire interest. Simultaneous independent activities are certain to disturb and hinder each other. Of course, too great a degree of monotony may be harmful and should be avoided also. Concentration of thought upon the task is a very important factor in satisfactory work. Refraining from conversation while at work is a valuable trait in an employee. To prohibit conversation would, of course, seem tyrannical and would probably be an unfortunate procedure on the part of management; but to bring about conditions whereby a minimum amount of irrelevant conversation occurs is an achievement worthy of a successful executive. If this can be done without antagonism or ill will, even without cognizance on the part of the employees, appreciable results in output will be immediate and worth attaining. There are many other causes for distraction of attention. Certain disturbances such as unnecessary noises are often detrimental to consistent effort.

The problem of fatigue has been given much study during recent years. It has been found that a moderate shortening of the working day has not involved loss but has brought a direct gain. The relation of fatigue to industrial accidents has also been brought into the foreground with other problems of importance in industry. The value of the psychologists in this, as in all of their investigations, depends on the practical application in industry of the conclusions reached in the laboratories. When industrial managers had no contact with the experiments of the laboratory, and the experimentalists were hesitant regarding association with industrial reality, there was little hope of satisfactory results.

The future possibilities for psychological experiment applied to industry are far reaching. The various needs and problems must be studied in connection with this effort to deal with the thinking processes of employees. Eventually there will be a certain acknowledged system of rules determined upon which may serve as patterns. Special industries will have their own problems solved scientifically. Problems of vocational selection and appointment, questions of plant layout, of utilizing ideas of employees, of building up morale among the men, of fatigue, and of many other vital matters in connection with production all belong to a field of research in which the psychologist plays an important part.

BOOSTER CLUBS

ONE of the marked indications of the growing spirit of cooperation and better relations between employer and employee in industry is the rapid growth of booster clubs. Briefly stated, the object of these employee's clubs is to give publicity to the employer's product and to enlist the patronage of the immediate community. One large railroad has imbued the employees with the understanding of their common interest and with an appreciation of the mutual welfare. This effort has produced results far from theoretical.

There is no secret formula for the development of a booster spirit among employees. It is a matter of educating the workers to have confidence in the management and to see their own position as industrial partners. If this is done, the employees will frequently express a voluntary request for the establishment of a booster club. Indeed, this should always be engineered, since the management cannot take the initial step in the matter and expect the idea to spread through the rank and file of employees without needless and treacherous suspicion.

The Booster Club, when started correctly is organized by the employees, through cooperation with the management. Officers such as Chief Booster, Assistant Chief, etc., are chosen and a spirit of enthusiasm begins to make itself felt. Every possible business trip, solicitation, or boost is sent in by the Boosters to the proper official. Hearty encouragement, of a non-financial nature, should be given by the management, either in the form of a personal letter or a published statement in the form of a house organ article or bulletin report. Windshield stickers, where these are not banned by local traffic authorities, can be provided for the employees motor cars. Such stickers can carry the trademark, sales slogan or other identifying mark of the company product. In other cases, spare tire covers carrying an appropriate message can be given the members of the Booster Club.

Modern business depends a great deal on the development of favorable public attitude, and the workers in their daily sphere of activity can be developed into splendid good-will builders. In addition to actually enlarging the sales for the product, the spirit of the Booster Club will act as a tie to the employee, greatly increase loyalty, and develop the valuable partnership spirit.

BESSEMER LIMESTONE AND CEMENT COMPANY MAKES IMPROVEMENTS IN METHODS

By E. D. Roberts

A SYSTEM of materially reducing the temperature of the cement as it comes from the dry mill, which is accomplished by passing the cement through air currents and reclaiming the material into Sly dust collectors, has recently been developed by the Bessemer Limestone and Cement Company thus adding another improvement in the manufacture of portland cement. Almost every producer of cement has experienced some trouble with his customers due to shipping hot cement. Cement, due to the friction of grinding, is very hot as it comes from the dry mill, and it does not cool materially while stored in the sealed concrete silos. If the cement goes directly from the silos to the job, it is sure to be warm when delivered. Therefore if the consumer experiences any trouble with his concrete, he will usually lay the trouble to green cement. The consumer will say the cement was green because of the warmth still remaining in it when it was received. In order to alleviate this trouble the men in charge of the Bessemer plant have, as the result of many experiments, brought forth the system noted.

The Bessemer Limestone and Cement Company was organized to take over the old Bessemer Limestone Company which had been producing flux stone at Bessemer, Pennsylvania for many years. This decision was due to a desire on the part of the management, of the old company, to obtain a greater return from the byproducts of the flux stone production.

The material at this quarry is a very high calcium limestone overlaid with varying thicknesses of shale, coal and clay. The coal and part of the shale is used in the manufacture of building tile and brick by the Metropolitan Paving Brick Company, which established a plant near the Bessemer Company's quarries, for utilizing the waste shales from the quarry operations. However, crushing the rock to the proper sizes for flux stone produced vast quantities of fine stone for which there was not a profitable market. Chemical examination showed that this lime rock and shale rock would make excellent cement if properly treated and proportioned. A survey also established the fact that these fines, from the regular output of flux stone, would easily keep a three kiln cement plant in continuous operation.

As the Bessemer Limestone Company had been successfully operating for years, as its financial rating was well established, and as the capability of the management was recognized, it was considered a wise step for the company to reincorporate as the Bessemer Limestone and Cement Company and build a plant for the production of portland cement, from these secondary products. As this company was strong financially, it was able to make a selection of cement mill machinery to suit requirements. The Allis-Chalmers Company has supplied the major units used in the plant.

Starting with three kilns, which ordinarily produce approximately 3,500 barrels, production has been increased until at the present time a daily production of 4,000 barrels is maintained. This is largely due to the ingenuity and resourcefulness of Mr. O. E. Wasson, the plant superintendent, and

General View of the Quarry Operations

his assistant superintendent Mr. S. L. Duvall. A second smoke stack, installed by the Rust Engineering Company increasing the draft and production, has been one of the major changes made in the interest of greater output. In addition to the cement cooling, previously mentioned, Mr. Duvall has installed a machine for the dustless extraction of cement when shipping from the silos.

Starting with the quarrying of the raw materials, we will now follow them through the different processes,—stripping, excavating, hauling, preliminary crushing and sorting, transportation to the cement plant, wet process, burning, dry process, storage, packing and shipping—required for the manufacture of portland cement at this plant. The quarrying will be treated very briefly as this work has been in operation for many years. However, here we find further proof of the progressive policy of the company in the installation of a new 125 Type Marion electric shovel, which was made this spring. The cement process will be described in detail after which certain special features, such as cleanliness of the plant, and the maintenance of safety campaign will be mentioned.

As the main purpose of the quarry is to produce flux stone, the quarry, as well as the preliminary grinding and sorting operations, has been placed under the supervision of Mr. A. J. Johnson, who is superintendent of this division. Mr. Johnson delivers the cement rock and shale to Mr. Wasson, the cement plant superintendent. In this department the material is passed through a Jeffrey pulverizer, before being placed in the storage bins.

To maintain the 3,000 to 5,000 ton daily output of flux stone with one ten hour shift, Mr. Johnson operates several quarries simultaneously. The lime rock in each is similar but the overburden varies. In the main, there is a layer of dirt on top of a 26 inch seam of coal. Directly under the coal is found a layer of fireclay followed by a thick strata of shale, varying in color from a brown to a gray. These layers are removed in the order named to gain access to the 22 foot layer of high calcium limestone, valuable for the manufacture of cement and for use as a flux in the steel industry.

Nine steam shovels are employed to strip and excavate the rock. Two number 76 Marions, one number 91 Marion, one number 37 Marion, one Type K Marion and one Type B Erie steam shovel are used to remove the overburden from the rock while two number 100 Marion steam shovels on railroad trucks and one new number 125 electric shovel, on caterpillar traction, are used for the excavation of the limestone.

The upper layer of dirt when excavated by the steam shovels is placed in standard gauge 16 yard cars and disposed of in a worked over portion of the quarry. The coal is next removed and stored for use or shipment as desired. After removing the coal the fireclay is removed. The shale is then drilled ready for shooting with Trojan powder. Two star drills, one electric and one steam driven, place holes in the shale, which, after shooting, is excavated by the steam shovels and placed in 5 yard Koppel dump cars. Four twenty-six ton Heisler locomotives move the shale, on narrow gauge tracks, either to the Metropolitan Paving Brick Company or to the receiving hopper at the cement plant. The various colors found in the shale are taken advantage of in the production of many

Loading Crushed Stone in Quarry

shades of brick, the desired shade being obtained by a selection of the proper color of shale.

After the removal of the shale, the limestone ledge is cleaned by sweeping. Four Loomis electrically operated well drills then place $5\frac{1}{4}$ inch holes in the limestone to receive the Trojan dynamite used in breaking out the rock. Three Ingersoll-Rand portable mine compressors furnish compressed air for operating the Ingersoll-Rand jackhammer drills used to place block holes in the large boulders created by a blast. Each of the steam shovels has a compressor mounted on its frame and is used to furnish the compressed air for placing the block holes in the boulders. With the air so convenient, it is a simple matter for the shovel attendants to drill and break up boulders while the trains of cars are being switched.

The new Marion electric full revolving caterpillar shovel has been placed where the greatest production is possible. As this shovel operates at 2,200 volts, a special transformer has been mounted on the under frame to furnish the 220 volts required to operate the Ingersoll-Rand compressor. This is also mounted on the shovel underframe and used when placing the block holes.

Forty-two ton Heisler steam locomotives hauling trains of ten 16 yard standard gauge cars serve the electric Marion shovel. Another shovel is helped by 26 ton Porter steam locomotives with standard gauge cars. The third rock shovel is aided by a Woodford electric haulage system. The cars used in this system haul 12 tons each and are operated in single units by a third rail electric feeder controlled by a man in a tower at the primary crusher.

Preliminary Crushing and Sorting

Standard gauge tracks are brought in one on each side of the number 24 Type K Allis-Chalmers gyratory crusher which does the initial breaking up of the rock. Hoists operated from overhead dump the rock from the cars directly into the crusher. This crusher operated by a 200 h.p. Allis-Chalmers motor discharges the rock on a 42 inch conveyor belt which carries it to two 16 foot rotary scalpers.

The scalpers discharge the oversize into two gyratory crushers, one a number $7\frac{1}{2}$ and the other a number 8. From these two crushers the rock is elevated, along with the rock passing through the scalpers, to the sizing screens. The rock from $2\frac{3}{4}$ to 7 inches is sold as flux stone, and sizes having a value for concrete aggregates are washed and placed in bins for shipment. The fines are discharged either on an outside storage pile or directly on a belt which leads to the receiving crusher at the cement plant. A belt under the storage pile of fines reclaims the limerock by gravity and discharges on a belt leading to the cement plant.

Storage at Cement Plant

As the lime rock and shale enter the receiving building of the cement plant the material passes through a Jeffrey swing hammer ballbearing pulverizer. The lime rock is brought from the crusher plant on a 24 inch conveyor belt and the shale is brought in 5 yard Koppel cars which discharge, from an overhead trestle, the shale into a hopper over the Jeffrey mill. The lime rock conveyor is shut down whenever a train load of shale arrives

Note the Hoisting Arrangement on the Shovel so that it can be run through the mill without mixing with the lime rock.

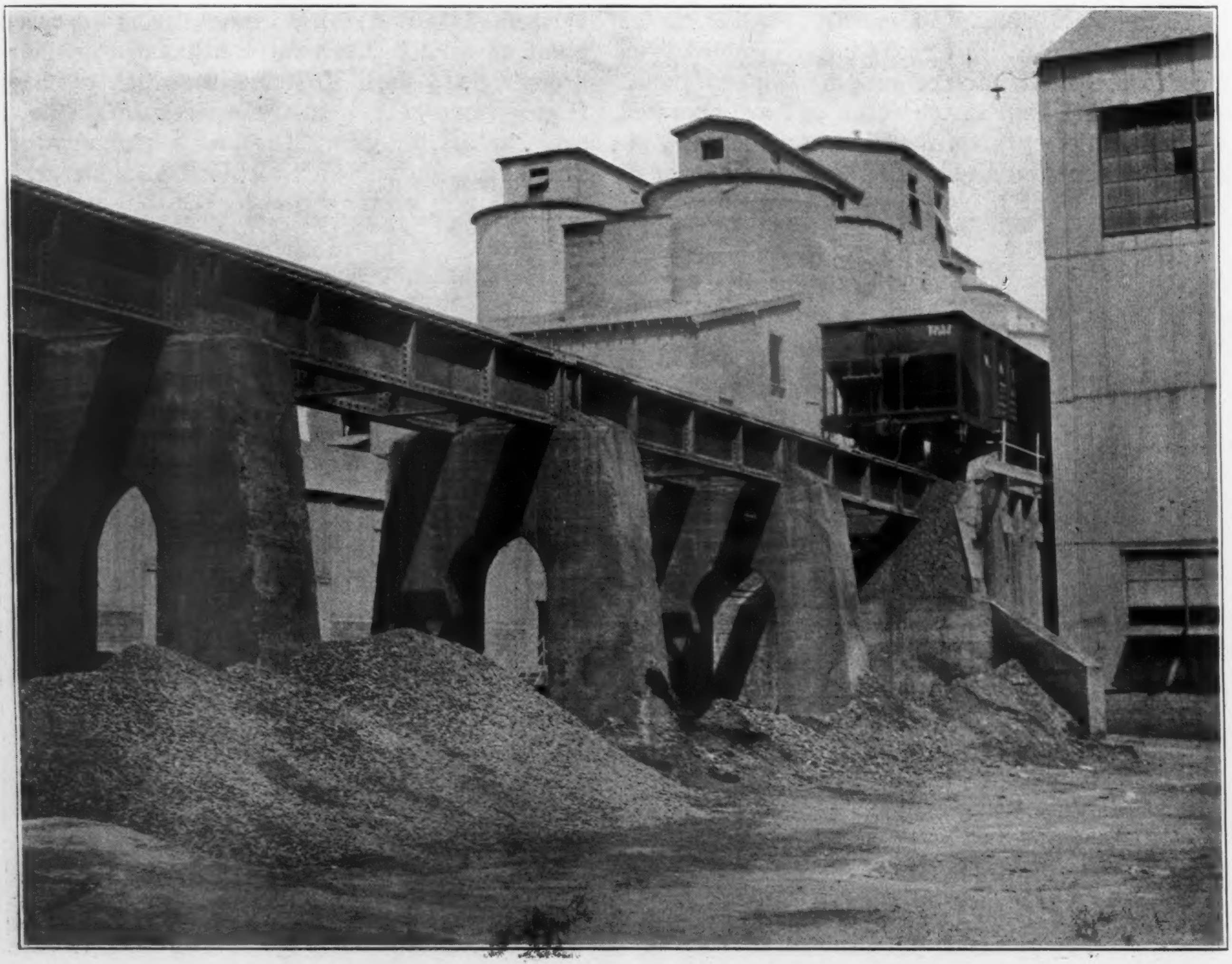
An inclined 24 inch conveyor carries the discharge from the hammer mill up into the top of the raw storage building where a distributing conveyor, fitted with a traveling Webster tripper, discharges the material into two large bins below. One of these bins is for lime rock and the other is for shale. A reinforced concrete tunnel has been constructed underneath the two bins and in the top of this tunnel have been placed gates with connections for feeders, which are home made, to properly proportion the two materials as they fall on the belt conveyor, which operates throughout the length of the tunnel. These two feeders, one for shale and the other for lime rock, are operated with individual electric motors and can be moved from gate to gate, under the bins, so as to provide a greater live storage.

The proportioning belt conveyor discharges on an inclined belt conveyor, operating at right angles to the belt in the tunnel, and travels up through a steel gallery to the top of the raw mill building. The mixture of shale and lime rock is discharged from the inclined conveyor either into a large circular steel storage bin, located directly over the feed end of the first compeb mill, or on a short inclined conveyor which in turn either discharges into the second steel bin or on a short horizontal belt which carries and discharges the rock into a third bin.

Wet Grinding

These three steel bins are located on a steel trestle and are over the feed ends of the three compeb mills, which each bin serves. Each bin will hold 100 tons of material. A feeder attached to the bottom of each bin feeds the lime rock and shale mixture at a uniform rate to the two stage compeb mills. These reduce the rock to the proper fineness before it is discharged from the mill and as water is added within the mill, the product is a slurry. Each mill is driven by a 500 h.p. synchronous motor through a Cutler-Hammer magnetic clutch. The motors as well as the compeb mills were furnished by the Allis-Chalmers Company.

A sloping trough placed under the discharge ends of the compeb mills receives the slurry as it runs out of the mills and carries it to a sump located at the end of the trough. The slurry is carried from the sump upward in a steel encased bucket elevator and discharged into a screw conveyor. This screw



Note the Substantial Trestle Construction Approaching Coal Storage Building. Silos in Rear.

conveyor carries the slurry to a distributing conveyor operating over the top of 8 large storage tanks.

Each of the large circular steel storage tanks will hold slurry enough to make 1200 barrels of finished cement. Compressed air furnished by an 880 foot Ingersoll-Rand compressor, is forced upward through the slurry from pipes leading into the bottom of the tanks. This air, in forcing its way through the creamy, muddy mass, keeps it agitated so that the slurry will not settle and form a hard mass at the bottom of the tank.

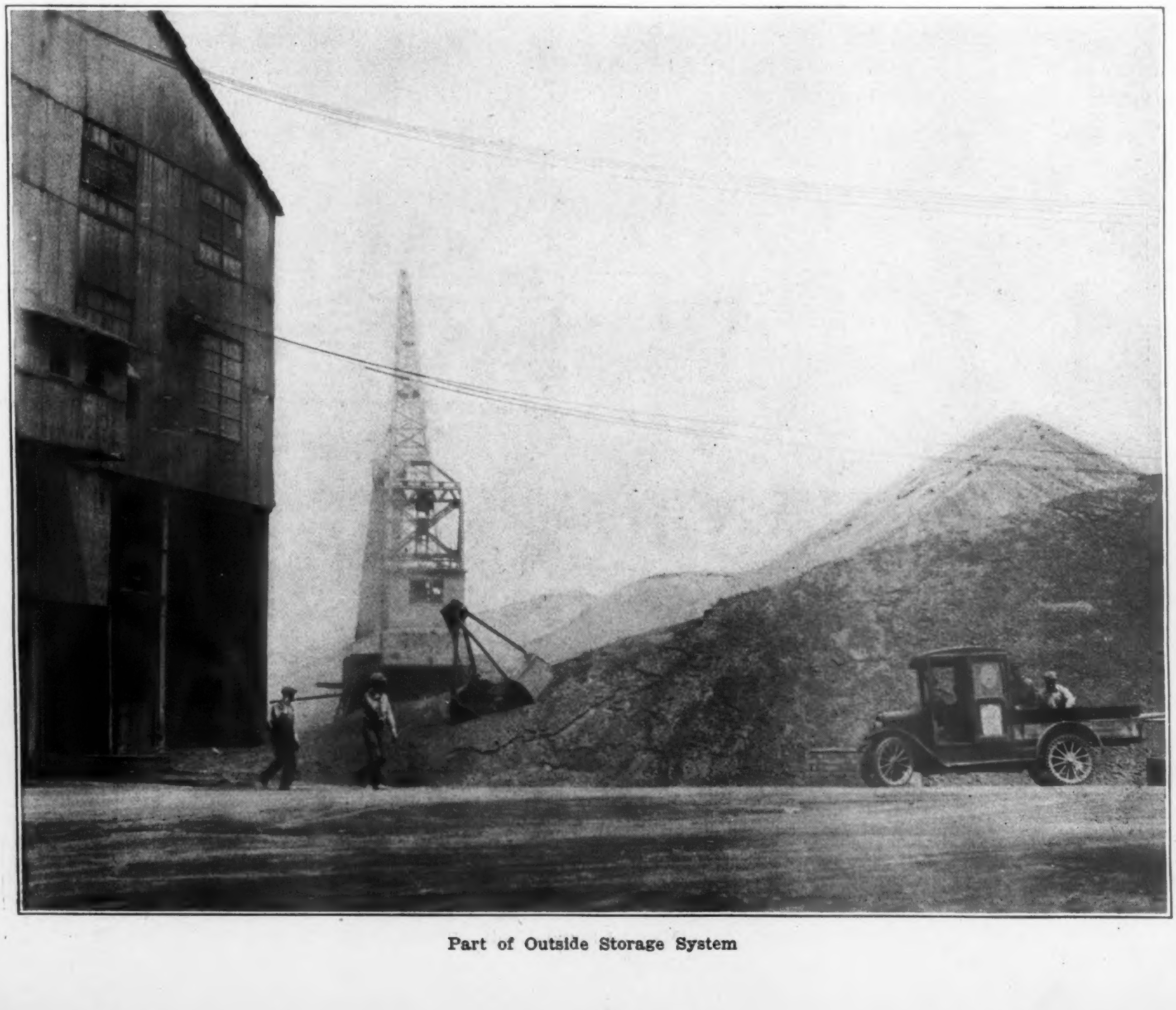
The slurry is drawn from each tank, as desired, through a 14 inch pipe leading to a main pipe line. This line leads to two large mixing basins, each 40 feet in diameter and 14 feet deep. The two mixing basins have been provided, one to serve as a feeder to the kilns while the other is being filled. Care is taken in filling the basins to see that the proper amounts are drawn from each slurry basin to give the required proportions of lime, iron, etc., in the final mix, as shown by the chemical analyses made of the slurry as it enters each of the storage basins. A Dorr agitator in each basin thoroughly mixes the slurry to prevent settling while it remains in these basins.

The slurry as it leaves the mixing basins, passes through a screw conveyor which leads to two bucket elevators, only one of which is operated at once, which discharge into another screw conveyor operating along the feed ends of the kilns. An outlet in the conveyor casing, opposite each of the three kilns, allows part of the slurry to enter a feed box. In each of these feed boxes is a ferris wheel feeder which controls the rate of feed to the kilns. These ferris wheel feeders are operated by an endless cable, driven from the same motor used to revolve the kiln.

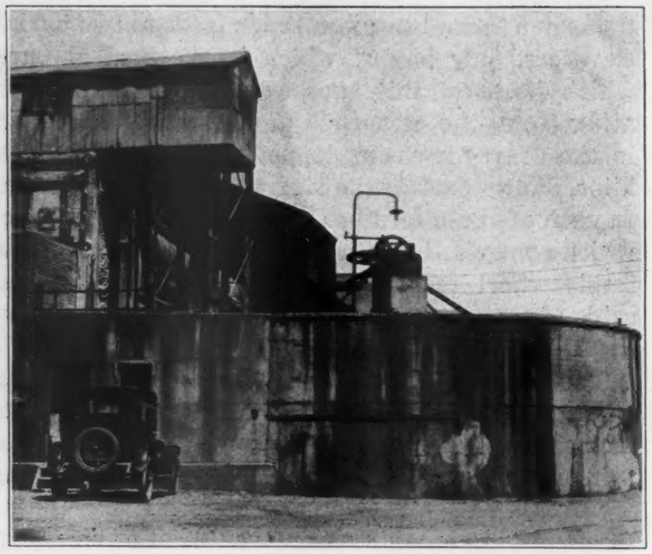
The slurry is fed to the different feed boxes at a much greater rate than that required for the kiln feed so that there is no danger of a lean feed. An 8 inch pipe, leading from the feed boxes, carries the excess slurry back to the mixing basin and at the same time maintains an even head of slurry in the feed box. By this method the buckets on the ferris wheel always contain the same amount of material, and insure an even kiln feed. Each revolution of the ferris wheel is noted by a recording device so that a record of the kiln input can be easily obtained.

Burning the Lime Stone

The three kilns are each 10 feet in diameter for 175 feet at the burning end with 60 feet at the



Part of Outside Storage System



One of the Mixing Basins

stack end 8 feet in diameter. Each kiln is revolved by a 100 h.p. Burke electric motor through a belt and gear reduction.

When the lime burning operations were first started one smoke stack 12 feet in diameter and 180 feet in height served the three kilns. However, in order to get a better draft, a new stack, 9 feet in diameter and 200 feet in height was erected last year. This new stack is lined with fire brick for the first 100 feet. Foxboro recorders, at the outlet of each kiln, record the draft pressure in inches of water and with this information the proper draft regulation can be maintained.

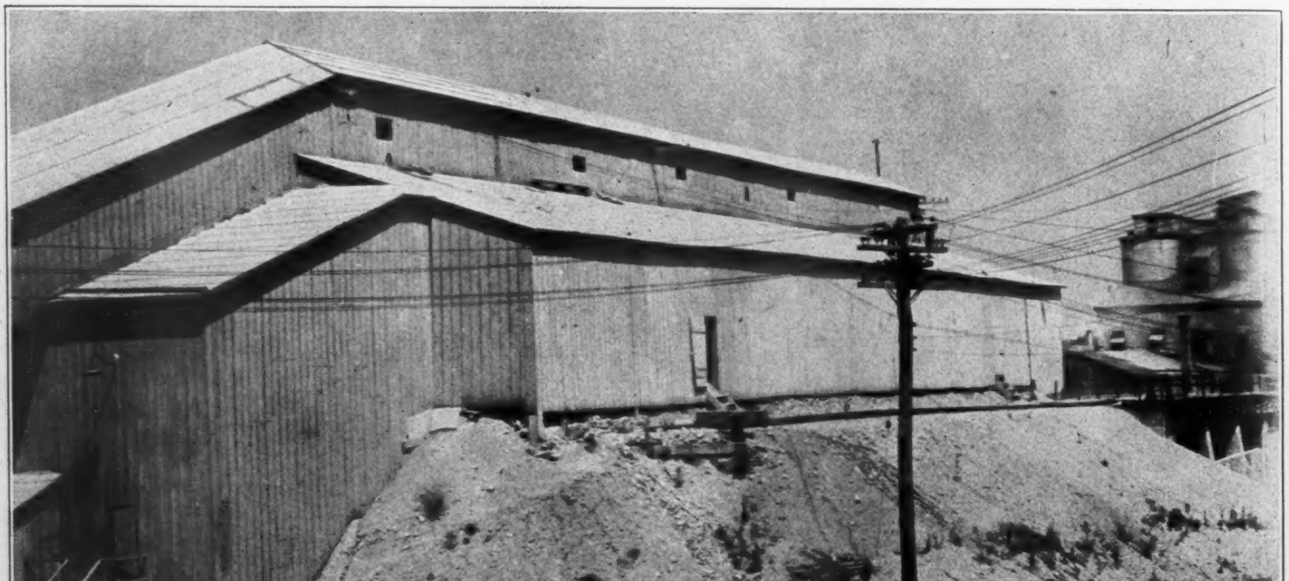
As the slurry passes through the kiln, due to its rotation and inclination, it gradually dries out and when it nears the lower end is fused into clinker. This clinker is then discharged at white heat into a chute which leads to a cooler located opposite the kiln but on the floor below.

Powdered coal is used as a fuel for fusing or burning the slurry into the clinker, which, when finely ground is cement. The powdered coal is taken into the kiln through a feed pipe which forms the exhaust pipe of a blower.

We will now leave the cement process for awhile and follow the using of coal through the pulverizing plant, storage bins and kiln feeders and into the kiln when having returned to the point of divergence we will continue with the clinker to the finished product of cement.

Coal is received at the coal pulverizing plant in bottom dump railroad cars. A trestle consisting of reinforced concrete bents and steel deck girders has been constructed so that these coal cars may be unloaded by gravity into a large hopper. The approach trestle to the hopper is used for outside coal storage when the coal is arriving faster than is needed and also to maintain a reserve supply. Located directly under the trestle, extending throughout its length, a tunnel has been constructed. Holes in the top of this tunnel, fitted with gates, allow the coal to fall on a conveyor belt when it is desired to bring coal from the outside storage. A drag scraper is used to pull coal to the holes that does not run through the gates by gravity.

The coal is given an initial breaking by a Jeffrey coal pulverizer. This is placed so that it can draw its feed either from the coal receiving hopper or



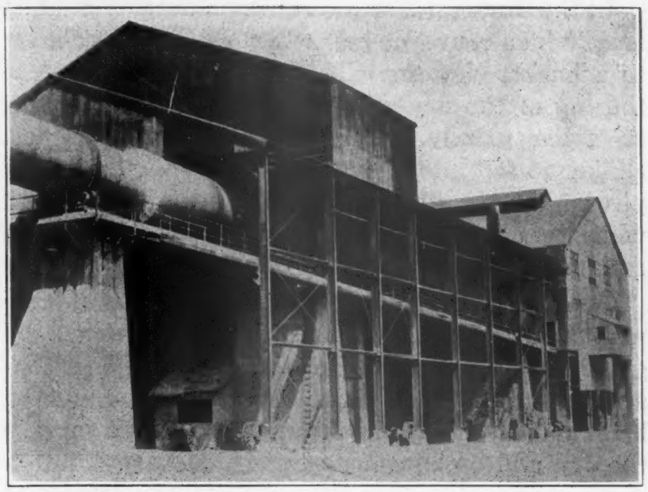
Material Storage Unit

the reclamation conveyor. From the pulverizer, the broken coal is carried up by a bucket elevator and discharged into a 6 foot x 60 foot Allis-Chalmers coal dryer. After passing through the dryer, the coal goes into storage bins ready for grinding. This grinding is done by three 6 roller Raymond mills which receive the dried coal through feeders connecting into the bottoms of the feed bins. Due to the centrifugal force exerted on the side of the mills by the rollers, as they rotate, the coal is reduced to a powdered form. The coal remains in the grinding chamber until it is fine enough to be carried off in an air current which is circulated through the mill by a number 11 Raymond exhauster fan. This air current carries the coal to a collector, where the coal is allowed to settle, due to the very low velocity of the air while passing through the collector. A return pipe from the collector to the mill removes any loss of coal which might not settle in the collector.

As the coal settles in the collector, the coal falls down the hoppered sides of the collector into a screw conveyor which carries the powdered coal to and distributes it into three kiln feed bins. The coal is drawn from these feed bins by Allis-Chalmers coal feeders which discharge the powdered coal into a 9 inch pipe carrying air furnished by an American blower. This pipe enters the end of the kiln at its center and causes the powdered coal to be blown into the kiln, where it instantly ignites and burns with a great heat.

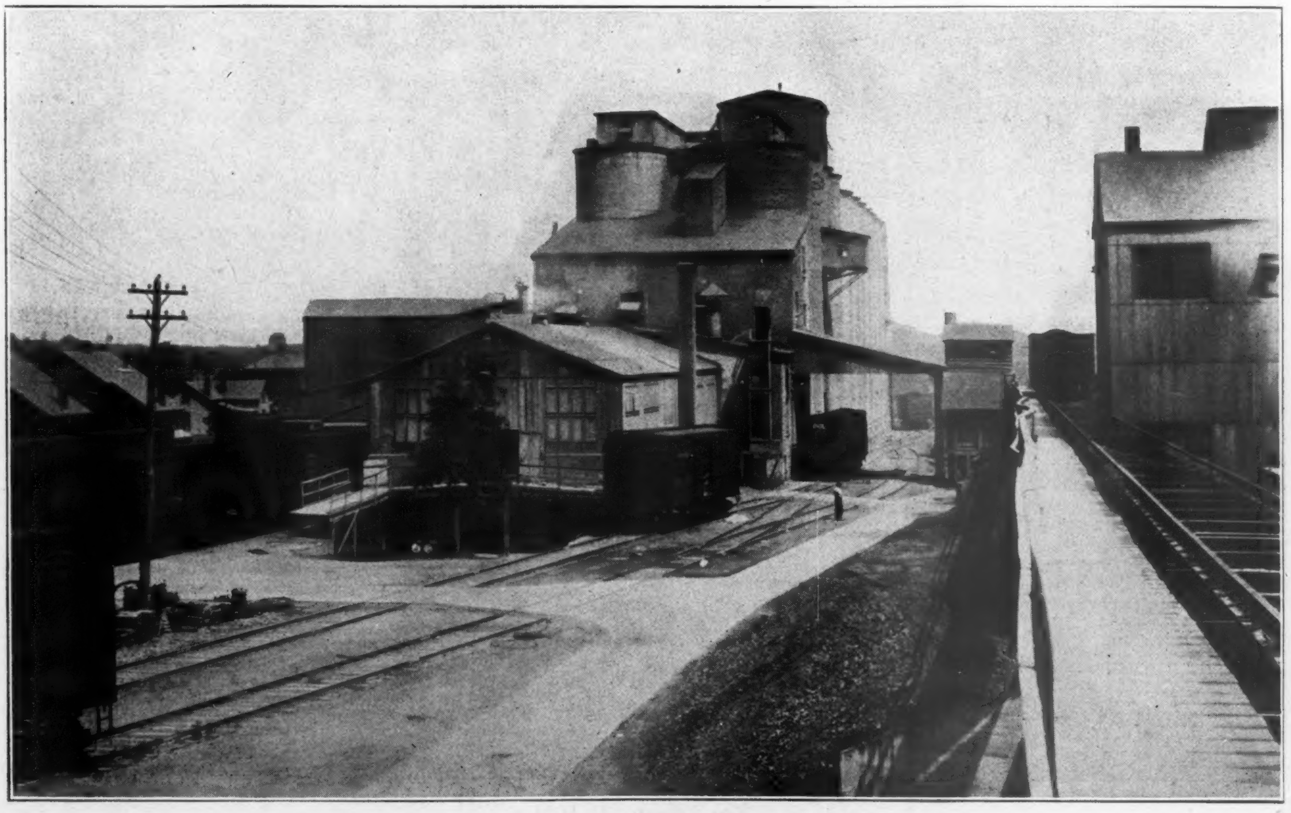
Cooling, Storing and Reclaiming

The clinker falls from the kiln through a chute into a cooler 8 feet in diameter and 60 feet long. Each kiln has a cooler extending in line with the kiln. With Allis-Chalmers design, these usually discharge the clinker through the open lower end of the cooler. At this plant however, the discharge is into an outside pit instead of on a conveyor or similar means for disposal of the clinker.



Kiln House

To further cool the clinker and allow it to age before grinding into cement, a Terry revolving crane, mounted on a high base, picks up the clinker, as it falls from the coolers, with a Blaw-Knox speedster bucket and deposits the clinker in a pile over a reclaiming tunnel. This crane has a boom 100 feet in length and enables the storing of 400,000 barrels of clinker. Care is taken to use the oldest clinker at all times thereby lessening the duty of the finish-mills.



Looking From Material Storage. Pack House and Silos in Center.

In the tunnel under the clinker storage pile there is a 20 inch conveyor belt which carries the clinker to a bucket elevator. This conveys the clinker to the top of the dry mill building and discharges it on a bar grizzly. This grizzly allows the finest clinker to fall into a large feed bin while the larger pieces are shunted into a Symons disc crusher which breaks the lumps and discharges them on the reclamation belt previously mentioned.

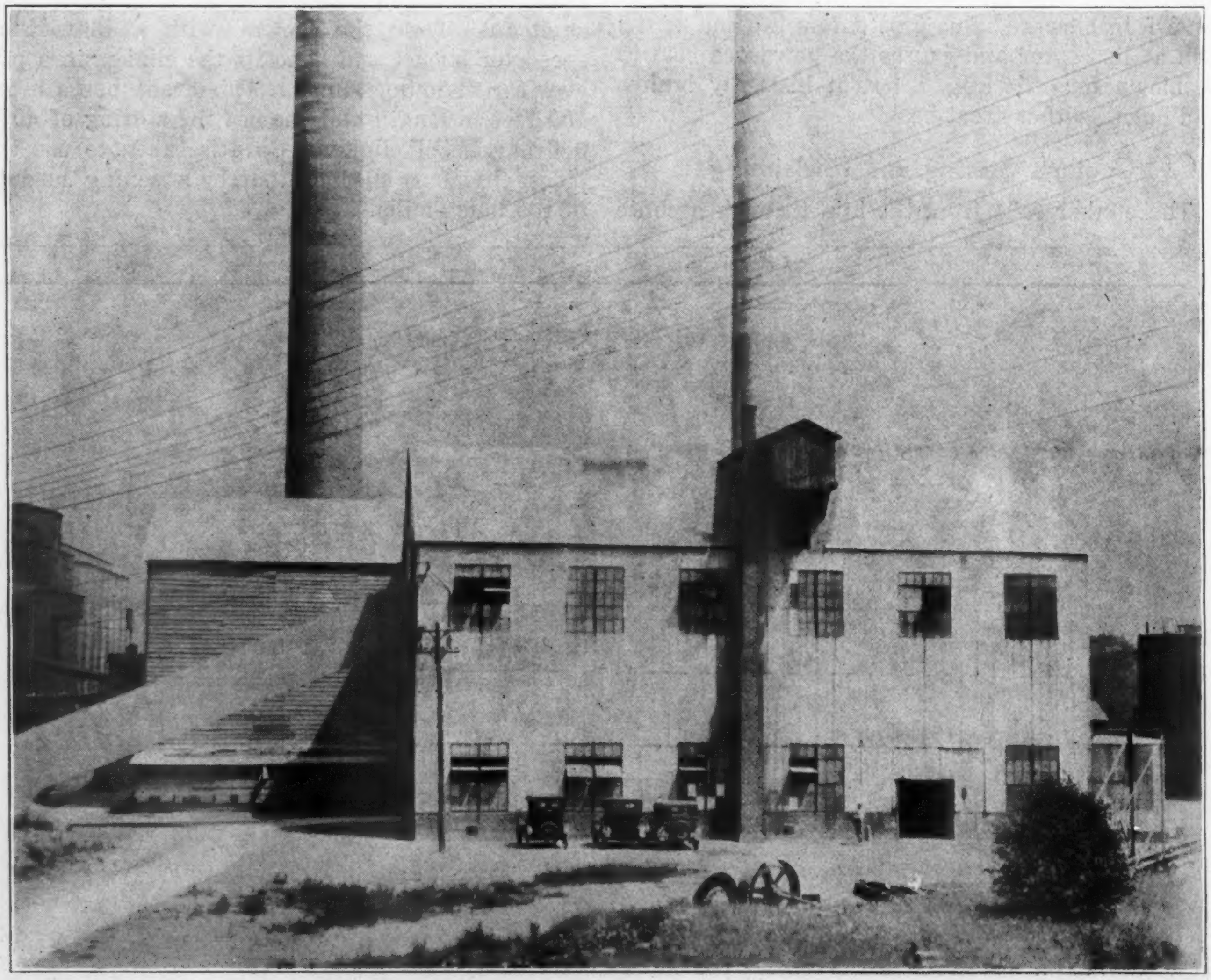
Gypsum is received at the plant in bottom dump railroad cars, and discharged from the cars by gravity into a large reinforced concrete bin constructed under the tracks. An inclined conveyor belt carries the gypsum from the track bin up into the dry mill building where it is discharged into a storage bin. A feeder connected to the bottom of this bin controls the rate of flow of the gypsum on a short conveyor belt which carries and discharges the gypsum into a Peck carrier.

Cement Grinding

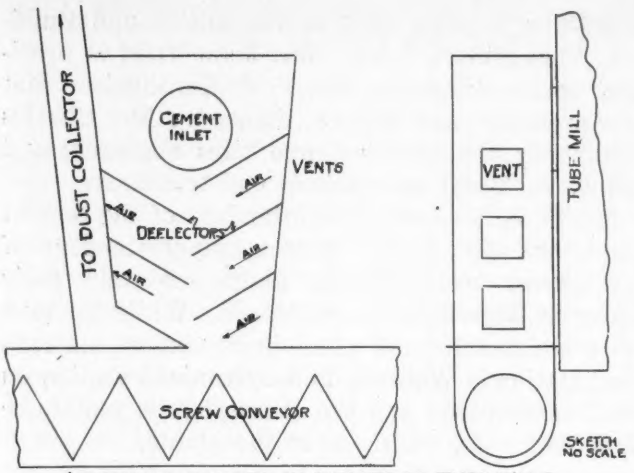
This Peck carrier also receives the clinker from the storage bin but through another feeder. These two feeders, one from the gypsum bin and the other from the clinker bin, proportion the mixture of clinker and gypsum for the mill feed. There are 4 fine grinding mills of the Allis-Chalmers type 7-26 which complete the grinding by two stages within the mill and discharge the feed as cement. These two stage mills have a similar drive as the mills used in the wet mill, 500 h.p. synchronous motors through Cutler Hammer magnetic clutches.

During this last summer, a new flow line for the cement as it came from the dry mills was introduced. A sheet steel housing was placed over the discharge end of each mill and sloping baffles, within this housing, causes the cement to cascade back and forth as it falls from the mill into the screw conveyor which operates under the discharge ends of all of the mills. An air pipe, leading to a Sly dust collector, is fitted to each of these housings, and vents are placed in the housing on the opposite side from the outlet to the collector. As the cement cascades down the baffles, air is drawn through it several times thereby cooling the cement. The finer cement, that might be carried off in the air current, is collected in a set of specially installed Sly dust collectors and discharged into the same screw conveyor which takes the discharge from the four mills.

A cross screw conveyor carries the cement from



The Pulverizing Unit



AIR CEMENT COOLERS AT OUTLETS OF TUBE MILLS

the above mentioned screw conveyor underneath the tracks and storage silos where the cement is discharged into a bucket elevator. This elevator discharges into another screw conveyor which operates over the top of the storage silos.

The original silos were five in number and were 25 feet in diameter and 80 feet in height. Later five more silos were added alongside of the first row and provide four interstice bins. Last year four more silos were constructed, each of which is 50 feet in diameter and 80 feet in height and segments of circular walls fitted between the bins furnish additional storage space and give the appearance of a row of seven interlocking silos.

Shipping Facilities

An improvement in the method for extracting cement from the silos has been furnished by Mr. Duvall who has installed special apparatus for this purpose, without dust and at a small cost. There are three rows of conveyors under the row of silos. The extracting machinery has been connected to the top of the conveyor under each bin outlet, also the bin outlets have been arranged with a dust proof connection to the machine. This connection consists of a passageway for the cement from the bin to the conveyors but the cement is required to pass through the extracting machine at an even rate due to a four vane wheel placed in the passageway. This wheel is driven by a motor connected to the machine. A track provides for easy transportation of the machine from one bin outlet to another.

To provide for a continuous flow of cement to the machine and remove any tendency to "arch over," so commonly experienced in cement extraction, a pipe is run up from the machine to the inside of the bin through the bin outlet. Compressed air, furnished by an Ingersoll-Rand air compressor and led to convenient points near the bin outlets by a system of piping, is introduced into the bin through this pipe which connects to the extracting machine. This jet of compressed air keeps the cement thoroughly stirred up at the outlet thus causing a continuous flow and with the wheel to control "flooding" no trouble is experienced in drawing off the cement. A very striking feature, noticeable to one who has inspected many "chambers of horrors," is the absence of dust due to the use of this apparatus.

The screw conveyors operating under the silos are operated from each end, being separated in the middle. This does away with excessive wear and heavy loads which are often the case when the entire length of conveyor is driven from one end. These conveyors, with the aid of bucket elevators, carry the cement to bins over the Bates packers, where the cement is passed through a fine screen to remove tramp iron. There are three packing units, one at each end of the silos and another across the tracks. As the shipping tracks have been placed along each side of the silos, it was necessary to have a special packing house for the truck shipments which average 1200 barrels per day and have reached as much as 2000 barrels per day.

Steel storage tanks with semi-circular bottoms are used for the storage of cement over the Bates valve packers. These packers, arranged in batteries, are placed high enough to discharge on belt conveyors. By a reversal in the direction of the belt conveyor cars can be loaded on either track.

A Sly dust collecting system collects the spill from the packing machines as well as dust in the shipping room. While the writer was inspecting the plant, outlets were also being placed in the baghouse to eliminate dust in that department.

Individual drives for machines have been provided in all cases. In one or two instances, belt reduction has been used but only when it was thought that a belt drive was the most suitable thing. Link-Belt silent chain drives have been used wherever possible. In most cases where reductions in speed are required between the motor and the machine, special speed reducers or transformers have been installed. The type of service generally determined the type of reducer; the Dorr agitators on the two mixing basins each have Jones speed reducers; the feeder from the gypsum bin is provided with a Foote gear reducer; a James worm gear reducer is placed on each of the cement extractors to give the proper speed for controlling the 4 vaned wheel; a Foote gear reducer has been placed on the clean-up screw under the dust chambers at the feed ends of the kilns; while Palmer Bee speed reducers are used on some of the conveyors.

One of the outstanding features of this cement plant is its cleanliness. Convenient outlets for the water have been provided, when washing the floors, wherever it is possible to do so. At these points, water is used daily to clean up all the spill or dirt. This washing water is supplied by a special 3 stage Fairbanks-Morse pump direct connected to a 25 h.p. motor. At points where water cannot be used,

One of the Synchronous Motors

dust collector outlets have been provided so that there is no excuse for allowing dirt to accumulate.

Mr. A. J. Eales, safety director for both the cement plant and the quarry of the Company's operations, has been able to keep the accidents at a very low point. Up to the middle of August there had been only three accidents to the cement plant forces, with a total loss of time of 38 man hours. All machinery is well guarded by safety devices, but to create a stimulus for greater safety precautions and to keep the thought before all of the men, a special bulletin board has been erected. On this board there are posted several horses with jockeys, as in a horse race, and each horse represents a department of the cement plant. These horses are started in a line on the first day of each month and are moved up a notch for each day passed without an accident in the department which the horse represents. Should there be an accident in any certain department, the horse representing it stands still. This stimulus to engender safety could well be installed at many other plants with good results.

After following through the description of the cement plant it will be seen that this part of the operations of the Bessemer Limestone and Cement Company while started to further utilize waste and the byproducts of their flux stone production, is a very important industry itself. Due to the cleanliness maintained throughout the plant, the safety measure taken, the high quality of the plant machinery, the improvements installed and the high output maintained, the management of the Company can well be proud of their achievements and the operators should take pride in being part of such an organization.

The Bessemer Limestone and Cement Company maintains its head office at 714 Stambough Building, Youngstown, Ohio. Mr. John Todd is president of the company; Mr. F. I. Kanengeiser first vice-president and general manager; Mr. Charles Schmitz is vice-president and sales manager; and Mr. G. G. Treat is secretary and treasurer.

Mr. O. E. Wassen, superintendent of the cement plant, and Mr. A. J. Johnson, superintendent of the quarry and crushing plant, maintain their offices at Bessemer, Pennsylvania. While the post office address for the plant is Bessemer, the railroad station is Wolford, Pennsylvania, a station on the Pennsylvania and the Pennsylvania and Lake Erie Railroads, which serve the plants.

New Finds of Potash Minerals in the Southwest

The Interior Department today announced that the Geological Survey has received from its field men in New Mexico, Texas, and Utah important information concerning potash—that a number of potash minerals have been found which afford increasing evidence of the similarity of American deposits to the famous deposits in France and Germany. Four of the potash minerals found in Stassfurt have likewise been found in New Mexico and Texas—namely, sylvite, kainite, polyhalite (both red and white), and langbeinite. In addition, carnallite has been sent in from Utah. Langbeinite and kainite have not been previously reported in the United States. Carnallite, sylvite, and kainite have furnished the basis of the German and Alsatian potash industries. In 1925, according to figures compiled by the Bureau of Mines from the records of the Bureau of Foreign and Domestic Commerce, the United States imported chiefly from Germany and France, 937,113 short tons of potassium salts from these sources, valued at more than $17,000,000.

The quantitative information necessary as a basis for commercial exploitation of the American potash deposits can be obtained only by core drilling. Fortunately, public interest in the commercial possibilities of these beds is increasing, private organizations are making core tests at different points, and whenever possible the Government is cooperating with these organizations. Moreover, the last Congress appropriated $100,000 for potash explorations during the current fiscal year under the joint auspices of the Department of the Interior and Commerce. The Geological Survey is to select the sites, make the analyses and tests, and report the results. The Bureau of Mines is to make the necessary contracts with owners, lessees, and drillers and to have the general direction of drilling operations. Core drilling will be done in the Texas and New Mexico area, and the tests thus made will provide a means for determining the thickness and potash content of the beds penetrated and will show the problems to be met in mining.

ANALYZING THE HUMAN FACTOR

By R. N. Van Winkle

THERE is nothing so interesting, or so profitable, to the quarryman or operator, as the human element, the human factor, the handling, placing and coordinating of man-power in present day quarry operation. The Crushed Stone Industry within the last ten years has been revolutionized by labor-saving machinery as has been all other branches of industry, but man-power will never be eliminated in quarry operations. This is the one thing many are overlooking to their own loss and possible embarrassment, so to come face to face with the human element and to find ways and means for handling this question, by considering the experiences of others, should not be amiss to any who are really interested in the industry as a whole and especially in their own particular operations.

Henry Ford has built up a wonderful manufacturing organization which has proven without doubt even to the most skeptical individual that production, or we might say mass production or large quantity production, is not only possible but highly profitable to the producer. This also goes for quarrymen, as mass production or large quantity production is the sure way to profit for the quarry operator. There are other things to be considered, but the quarry with a real operating or tonnage production record, nine times out of ten, is also a profitable, money-making, dividend-paying company with an organization that has solved the human element equation. A recent article stated that the Ford plant at Detroit had turned out as many automobiles in a five day week as it had in a six day week and that the five day week schedule had already been in effect since the early weeks of last spring, so it is not an experiment any longer. This exceptional record has been accomplished by speeding up in all departments, and the speeding up has been accomplished, not by speeding up machinery, but by speeding up the worker by the merit system of awards. The reason that Ford is taken as an example is that the reader is more or less familiar with Ford activities, due to the publicity which this firm receives. It therefore makes a greater impression than if The Utah Copper Company or The American Locomotive Company had been quoted which possibly, in an organization way, are doing as great or greater things than Ford.

We do not advocate a five-day quarry week, but there are ways of speeding up production and accomplishing quantity or mass production, or to use

Keep Plant Clean—Painted and Tidy. Note Safety Sign Placed at a Psychological Place—The Employment Office.

the quarry vernacular, increasing tonnage with the same or even a smaller number of men. It has been generally accepted that employment fluctuates with production, and that, barring revolutionary changes in methods, a given labor force is necessary to produce certain output. A great saving in the amount of human energy necessary to turn out a given quantity may be accomplished, and this industrial-economic development which is applicable to the stone industry, as well as to other branches of industry, bids fair to become one of the greatest developments of the twentieth century. The writer has done considerable work in handling or managing "sick propositions," quarries and crushing plants which have failed to produce, for one cause or another, quarries which had good mills, fair quarries, good equipment and excellent sales possibilities, quarries which were the last word in layout and mechanical design, which were failures from a production viewpoint. When attempting to find the cause of these production and financial failures, it is usually found that there has been a lack of organization and an utter lack of regard for the human element, the "worker," the rank and file of employees. Remember that as a manager, owner or superintendent you can accomplish only a certain amount of work, you have a capacity of one man, not a superman. Again it is not what you do with your hands that makes for success in your quarry but what you can do with your head to organize your proposition so that the "worker" will also think the same way and then you may supervise his activities. Regardless of how good an operator or executive you may be, success is absolutely dependent on the men under you. You are as dependent upon every man in your organization as he is dependent upon you, perhaps, more as he can leave and go elsewhere, a thing which you, as a superintendent or manager, cannot do if you are not a producer and dividend payer.

Experience is our greatest friend and teacher, while ignorance is our worst enemy in business, and this saying is true for the quarry industry. Since last February I have been interested in one of these operations which was apparently a failure. It was one of those quarry propositions that had good equipment, a modern mill or crushing plant, a fair quarry, and almost everything but low operating costs and mass or quantity production, which usually go hand in hand. This proposition has been almost solved, not by the efforts of one individual, but by analyzing the human element and using it to obtain a profitable and tonnage output basis. This result has been obtained by organization which was backed up by every employee. The first duty was to get out among the men themselves, learn of their good traits and also their bad traits, find out where each man would do the most good in the reorganization, search out

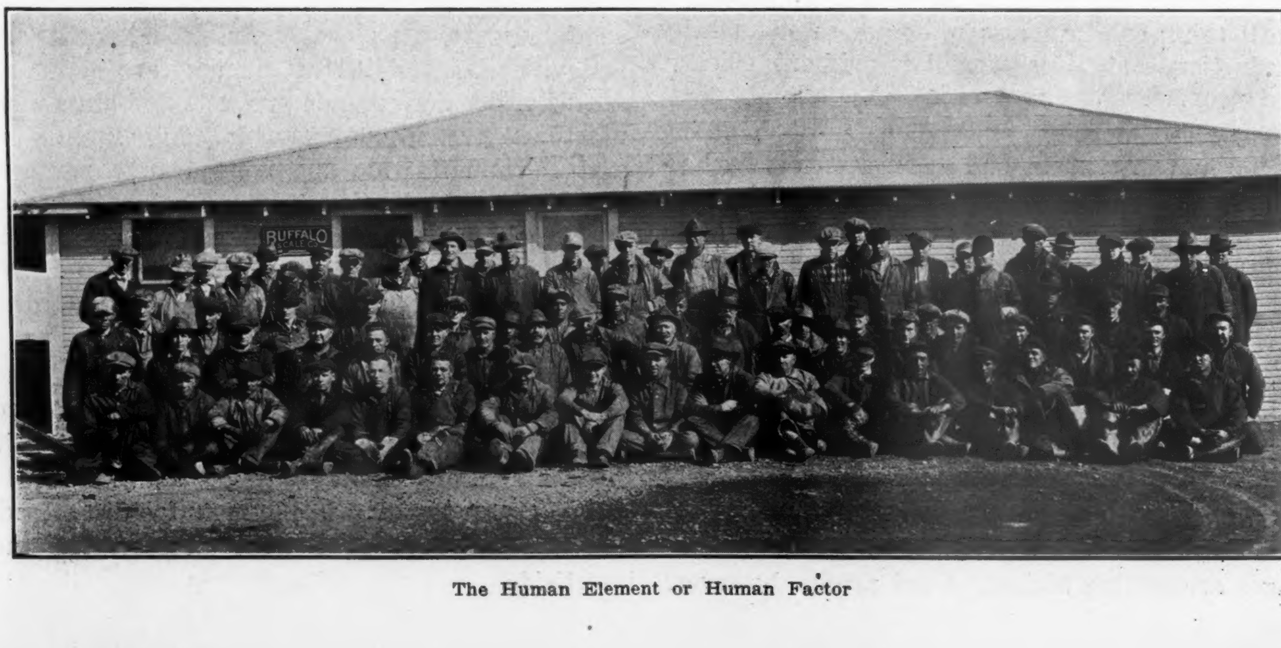
The Supervision—Reading left to right: Brenley (Lights) Electrician, Holler (Fat) Master Mechanic, Cryba (Dutch) Top Walker, H. R. Cox (Uncle Harry) General Supt., Miller (Joe) Bottom Walker, Chapin (Steve) Track Boss, Overacher (Walt) Dump Boss.

the weak spots, petty leaks and minor delays, since it is the small things that are often overlooked and are costly. The big things, as a rule, are so noticeable, that they are easily seen, but experience, constant watching and close application alone will observe the petty and minor drawbacks. After getting to know the men and quarry layout, mill, machinery, rock and trade and customers' demand, the next work was to reorganize. Preference was given to the present employees who had an opportunity as foremen and sub-foremen, provided they measured up to the position. Failing this we went outside and obtained the proper men. It is a good thing for a quarryman to have a large following of men who can fill these positions. When the foremen and sub-foremen had been chosen, each was given a written or drawn chart of his duties and responsibilities, taking care to see that these responsibilities and duties did not overlap, because if they did, it was a hard matter to place responsibility. The most efficient organizations are those where the duties are exactly known and therefore the responsibility is definitely fixed.

When these written instructions were given the foremen, they were also given the authority to handle the situations for which they were held responsible. Authority and responsibility must of necessity go hand in hand. The superintendent handles all matters through his foremen, and weekly meetings are held where open discussions of operating problems are given. These meetings have helped wonderfully in getting a better feeling and closer cooperation throughout the plant. Again it is usually a wise thing to let the men know what you are trying to do, to give them cost figures, production records and all information possible. Giving them some of your problems makes better men and arouses their interest in something aside from their daily routine, gives them something new to think about. Let them in on your troubles and problems, and then let them share in any success the proposition may attain or deserve. To make a success of any quarry proposition today, an executive must live his job and in turn he must in some way make his employees' work of enough interest to them so they will live their jobs and not work for just quitting time and payday. The monotony of a man's occupation quite often makes him lose interest in his work. There is little or nothing about it to challenge his ambition to be skillful; he hungers for variety and is often bored with standardized motion.

Proper supervision is another excellent means of accomplishing production, and by supervision is meant the proper number of foremen, subforemen, gang bosses or leaders. If there are five men available to do a certain job, more work will be done in less time if one is appointed a boss or leader than by letting all five work unsupervised. In one case you can hold one man responsible for results and get results; in the other case with no supervision or leader, all five will be equally responsible—and also equally irresponsible, resulting generally in very little being accomplished.

One of the greatest interest arousers for the men is cleaning the quarry, buildings and surroundings. Steam shovels and locomotives should be cleaned up and painted. It should be possible for crews to get paint and it should be used. The building should also be painted and electric lights installed where necessary. The property should be policed at regular intervals and all rubbish, wood, and everything which gives the place an untidy appearance should be removed. When the men see the interest taken in the looks of the operation, they will also take an interest in the plant and become proud of their surroundings, job and equipment, and this spirit is necessary to obtain a big tonnage production. When camps or housing and feeding facilities are located in connection with quarry operations, these should also



The Human Element or Human Factor

be kept clean, tidy and the food should be wholesome. When rent is charged for living quarters and meals, the revenue derived over and above actual expenses should be put back in the way of improvements, as you are not in the boarding house business, but are doing this as an accommodation to the employees in an endeavor to get a better class of men and to keep them satisfied. It is usually found that what men really need and what self-respecting men really prefer is not charity, but a square deal and opportunity. There have been too many mistakes in philanthropy. The help that counts for something is that which goes to the man who helps himself and which is reasonably contingent on his willingness to do so.

Safety methods and practices have an appeal to all workmen if properly presented. In our particular operation the safety idea was first put over with the foremen and sub-foremen, and they in turn carried it to the men, The management also provided an illuminated safety bulletin board and put up at advantageous places safety signs in catchy colors. The results of this campaign have been extremely gratifying, as the company doctor, who before was a regular visitor, has been in the past month a total stranger, as no accidents have happened. With proper attention to accident prevention we will come to the point of realizing that accidents and production need not increase in the same ratio; but rather that production and the earnings of employer and employee alike will increase as accidents decrease and safe working methods become firmly established.

It might appear that this article is stressing the human element and human factor too much, but experience proves that an ideal quarry layout with all the modern machinery is useless as far as producing tonnage of rock is concerned, unless there is an organization of interested efficient men to handle it. Organizing the human element has more to do with the success of an industrial enterprise than modern machinery. Modern machinery is a great thing and is necessary for mass or quantity production, but it is worthless without efficient and proper man-power.

The most important suggestion for the handling of the human element or human factor is by hospitality. A "Good Morning" here and a "How are things going, boys" or a good word dropped occasionally by the executive goes a long way towards increasing efficiency. This hospitality costs nothing, is unlimited in supply, can be manufactured from nothing and without cost, is in great demand and yields huge profits.

The stone or quarry industry in many ways is similar to other branches of industry, and if this business is analyzed it will be found that the margin of profit each year is getting smaller, for commodity prices are tending to decline, while wages are getting higher. Good profits, however, are going to the companies and larger concerns who are able to make the most of the economics of large scale, or mass production. The stone or quarry industry is in exactly this position; we are beginning to find profits on a ton of crushed stone surprisingly small, but it is possible for owners, managers and superintendents to stimulate production by activities among their organization, as partially outlined in this article.

Uses of Fluorspar

Fluorspar, or fluorite, is a nonmetallic crystalline mineral that usually occurs in glassy, transparent cubes or cleavable masses, states the Bureau of Mines, Department of Commerce, in a recent report. Less commonly it is granular or fibrous in structure, and occasionally is banded. Fluorspar has a specific gravity of 3.2, is brittle, has a hardness of 4, and can easily be scratched with a knife. Chemically it consists of calcium and fluorine in the proportion of 51.1 to 48.9. In color fluorspar ranges, according to purity, from a clear colorless, or slightly bluish, glasslike substance through various brilliant hues, of which purple and green are most common; much of it is white and opaque.

The market for the bulk of fluorspar sold in the United States depends on the condition of the steel industry, and the demand fluctuates with the rise and fall in the production of basic open-hearth steel. From 80 to 85 per cent of the fluorspar produced in the United States is used as a flux in basic open-hearth steel furnaces. Steel makers require that such fluorspar be in pieces not larger than three-quarters inch and that it show an analysis at least 80 per cent (preferably more) calcium fluoride and not more than 6 per cent silica. This flux is used chiefly for giving fluidity to slags, but it also facilitates the passage of impurities such as sulphur and phosphorus into the slag.

Fluorspar is used extensively in the manufacture of ceramic products, such as enameled and sanitary ware, opalescent glass, facing for bricks, and vitriolite, and in the manufacture of hydrofluoric acid. For ceramic products and glass manufacture a ground fluorspar analyzing 92 to 98 per cent calcium fluoride and from 1 to 4 per cent silica is demanded. For the manufacture of hydrofluoric acid fluorspar is sold either in lump form or pulverized and is usually guaranteed to contain not less than 98 per cent calcium fluoride and not over 1 per cent silica.

Fluorspar also finds use as a flux in some blast-furnace operations and in iron and brass furnaces; in the smelting of gold, silver, and copper ores; in the refining of copper, antimony, and lead; in carbon electrodes; and in the manufacture of sodium fluoride, used as a wood preservative and insecticide.

OTTAWA SILICA COMPANY DOUBLES CAPACITY DURING THE PRESENT YEAR

By A. C. Edwards

MANY new uses are continually being found for silica and silica sand, and as each of these uses calls for a greater supply each year there is a rapidly growing demand for the production of this material. In order to meet the urgent call for silica sand and also silica prepared for various special uses, the Ottawa Silica Company has this year doubled the capacity of its two plants at Ottawa, Illinois. This company can now be said to be the leader in the production of pure graded silica sand and commercial silica.

The Ottawa Silica Company was incorporated in 1901 for the production of silica sand. At first one plant was found to be large enough to meet the demand, but as business increased, a second plant, called Plant B, was later added. This second plant is located some distance from the first and situated nearer the center of an additional sand producing area which was purchased. In 1922, the company was reorganized as a Delaware corporation retaining the same name, and plans were made to double the capacity of the two plants.

However, before starting to enlarge the plants, a new power house was built to replace two small ones which were then serving the two plants. This new power house located alongside of Plant A, will adequately take care of the increased capacity of the two plants. The steam for operating Plant B is carried in two large insulated pipes through a worked out portion of the pit. The power house furnishes steam for operating the pulsometer pumps. which are used to transfer the sand from the different faces to the elevators at the different plants, heats the plant buildings, furnishes the steam for operation of the sand dryers and heats the water used for hydraulic mining of the sand in winter or during freezing weather. This company owns over 500 acres of what is called "Sand Rock," which is

Hydraulic Mining of Sand

General View of Operations

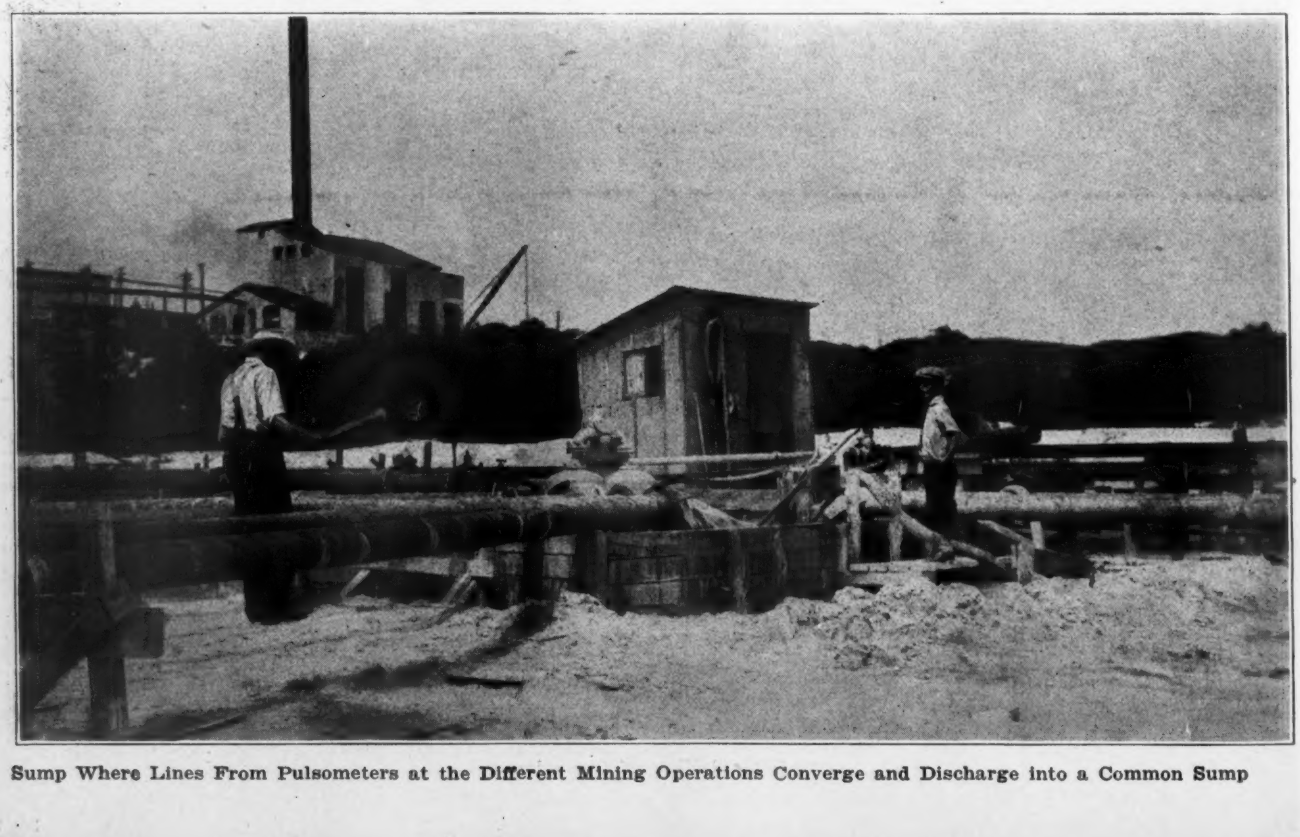
Close-up of Steam Pipes Showing Expansion Bends

Tunnel Leading Under Street Railway Tracks to Operations on Opposite Side

what geologists have termed St. Peter's sandstone, and underlies at a great depth a large area of the middle west. At Ottawa this formation is exposed, giving evidences of earth movements that have lifted a block of rock three or four miles long, reaching along the Illinois River below Ottawa, Illinois. At the lower end of this deposit is a place called Split Rock where the sand rock formation ends abruptly, giving evidence of a great faulting at some time in the past which caused this material to be found a thousand feet above where it is usually found in the central states.

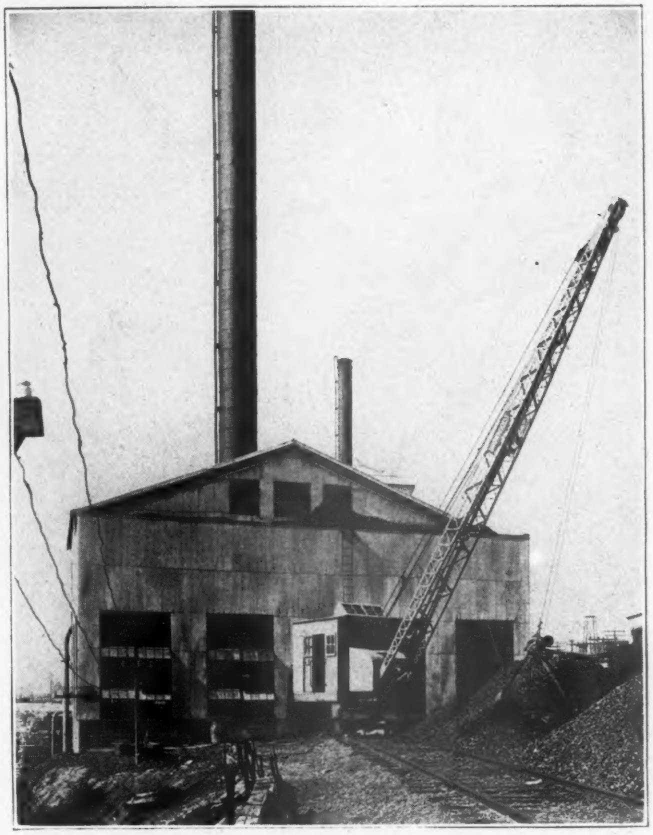
This sand rock was the result of the settling, in a large body of water, of vast quantities of wave washed silica sand upon which was deposited a great overburden of material which, by its weight, compacted the sand into a rock mass. At the time it was formed there was very little foreign matter present to form a binder and as a consequence the rock easily turns again into sand when it is shaken by a blast.

Much of the rock has been discolored by the entry of waters containing impurities, but the deposit owned by the Ottawa Silica Company is re-



Sump Where Lines From Pulsometers at the Different Mining Operations Converge and Discharge into a Common Sump

Plant A and Power House

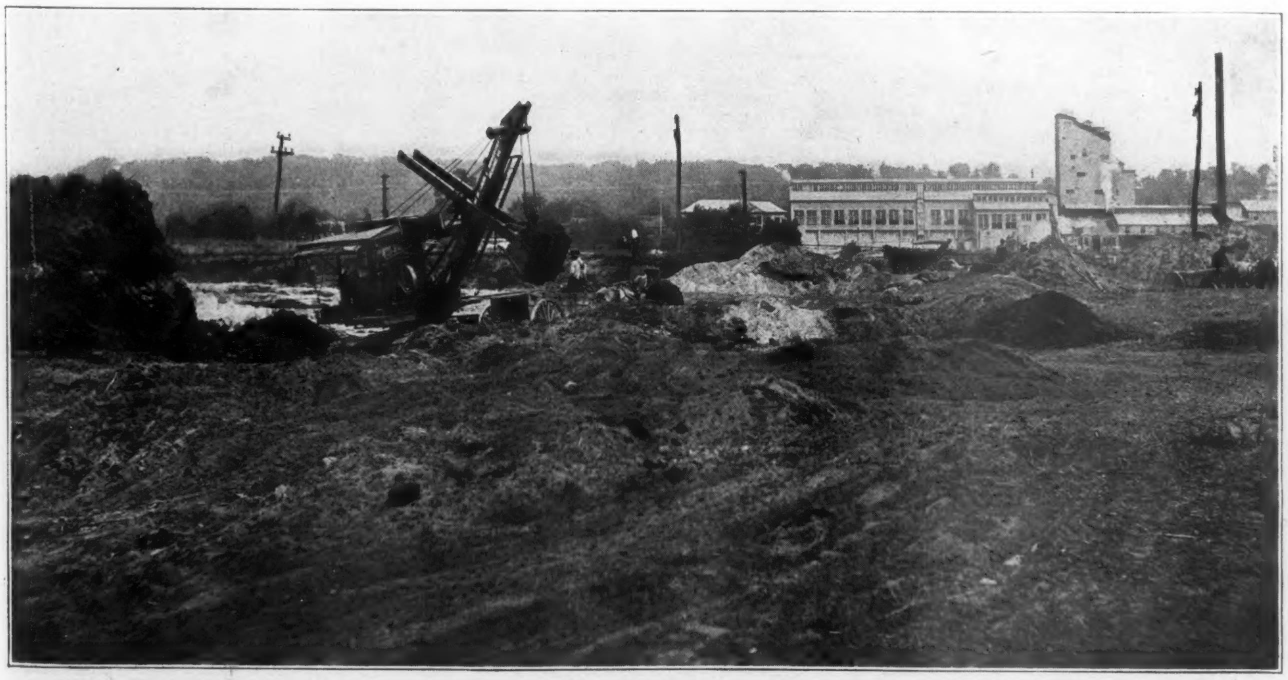


The New Power House

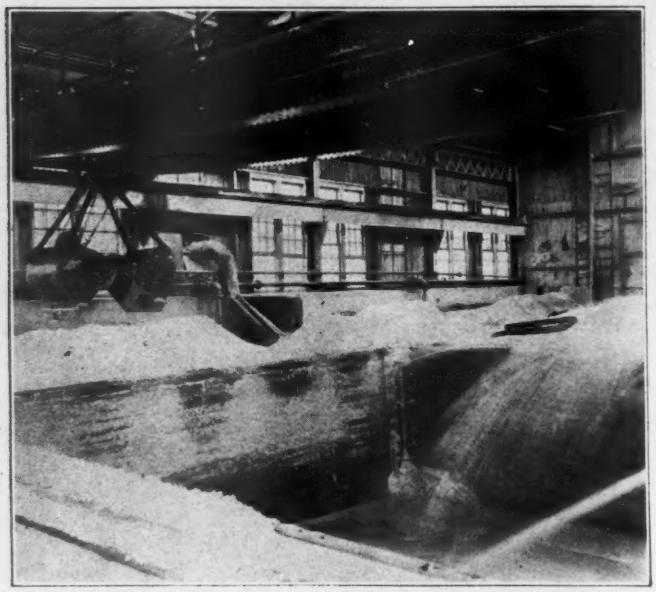
markably free from such discolorations or impurities and this company can easily produce sand that runs 99.89 per cent pure silica.

The important uses for silica sand may be grouped under two main heads. The main use is as moulding sand in steel and iron foundries. Moulding sand does not necessarily need to be pure but should be free from lumps. The other group includes uses where pure silica is required or where the sand must be carefully graded and free from foreign substances. Due to the purity of their deposit, the Ottawa Silica Company are producing graded and screened silica sand. That these efforts have met with success is shown by the fact that this company have had to increase the capacity of their plants several times, adding new machinery, some of their own design, for this special field. Today this company ranks the highest in shipments of white silica sand.

Some of the many uses for silica sand might well be mentioned in order to give an idea of its applications. With many companies, moulding sand would require the greatest tonnage but this company applies only a small part of its output to this field, and the glass making industry uses the greater part of their output. Other uses are for cement testing, white stucco, white concrete, pebble dash finish, setting sand for green brick, manufacture of refractory brick, sawing sand for stone



Stripping the Overburden



View of Drain Bins

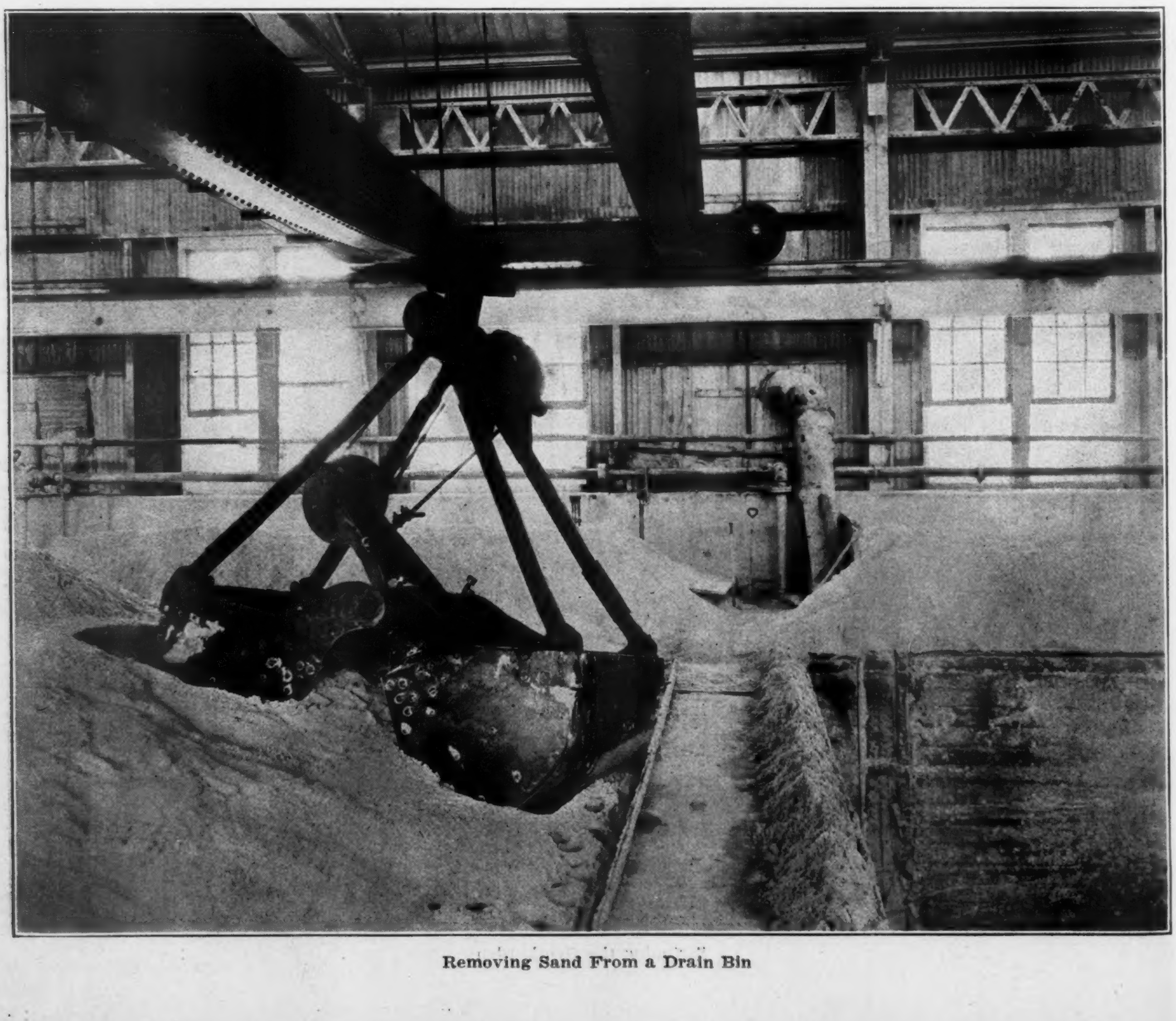
cutting, sand blasting, filtration sand in municipal filter plants, roofing materials, manufacture of silicate of soda, manufacture of cardboard and water glass. When finely ground, the sand is used for silica wash in steel and iron foundries, manufacture of stucco, enamel-ware and porcelain and many other chemical applications.

Great care has been taken and the best machinery installed in order to secure a pure, carefully graded silica sand and finely ground silica to meet any specification. For example, the sand is washed six times in the process of handling and grading, the water used being secured from a specially drilled well. This has been done in order that no trouble should be experienced due to using natural water supplies that might become dirty during flood or rainy periods.

We will now follow the material from the deposit through the plant and note the method of handling and preparation for market.

The deposit is overlaid with an average of two feet of sandy soil. This soil is carefully removed in order that the washing process shall be more efficient. A Pawling and Harnischfeger gasoline shovel equipped with a ¾ yard bucket excavates the sandy overburden which is taken away by a fleet of Graham Brothers trucks equipped with dump bodies. Men follow the shovel sweeping the surface with brooms, after which the surface of the sand rock is subjected to an air blast to remove any particles that might have escaped the shovel or brooms.

After the surface is cleaned satisfactorily, vertical holes 8 feet deep and 6 feet on centers, both



Removing Sand From a Drain Bin

ways, are drilled by Ingersoll-Rand jackhammer drills, the compressed air being obtained from an Ingersoll-Rand compressor. Du Pont dynamite is used to shoot these holes which when shot throws a loose layer of pulverized material over the sand rock below. This loose material later provides a blanket to protect the rock below from freezing during the extreme wintry weather so that operations can be carried on through the year.

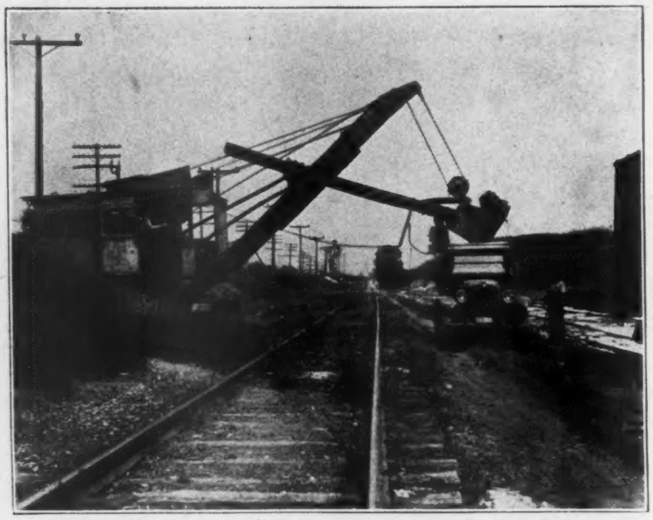
Horizontal holes 22 feet in length are drilled into the working face at the floor level, which is 60 feet below the top of the sand rock. However, the sand rock extends to a much greater depth than this but this depth has been found to be the most economical for working at present, owing to the water which has to be removed from the pit. Each of the horizontal holes is sprung at the back and washed out to form a pocket for the powder charge. Several holes are loaded at once, all except one being loaded with slow burning fuses. This other hole is shot with an electric detonator which causes the material to fall in front of the other holes, thus providing additional tamping for them and also a blanket to keep the sand from flying. This precaution is essential as the quarry is located in the City of Ottawa.

An inspection of the deposit before the dynamite is exploded would give the impression that it is solid rock. However, the blast reduces the rock to a fine granular form or sand, due to the absence of foreign materials that would have formed a binder producing sandstone.

Water is next played on the face by hydraulic giants which secure their supply from American centrifugal pumps. The sand and water flows from the face of the rock to a sump in which a pulsometer pump, of their own make, is working. These pulsometers pump the sand and water from the various faces to a common point which discharges into a sump. A larger pulsometer is located in this sump which pumps the material to

Steam Line to Plant B

View Showing Layout of Pump Lines From Different Deposit Faces



Shovel Loading Dump Truck with Material Excavated for the Construction of Additional Track Facilities

the foot of the incline sand elevator that carries the material to the top of the wash mill.

In winter, the water for hydraulic mining is heated by passing through special heaters. These are made of light material so that they may be easily handled. This warm water easily melts any ice that might have formed on the working face of the rock.

The elevator used to raise the sand from the pipe line discharge to the receiving tanks, located in the top of the wash house, is really a chinese water conveyor and has been found to be the most successful and economical method for elevating silica sand. This elevator is built on a slope of 7 inches in 12 with 150 inch centers for the head and tail pulleys. Cleats 2 inches by 4 inches fastened to the belt, at intervals of 12 inches, traveling at a speed of 728 feet per minute drag the sand up a trough. So that any repairs may be made easily these cleats are fitted with 1⅛ inch half soles. These take the wear, which is so great that the half soles have to be replaced every two or three weeks. Due to this excessive wear the trough, in which the sand is conveyed, is fitted together without nails and thus removes any metal rubbing surfaces.

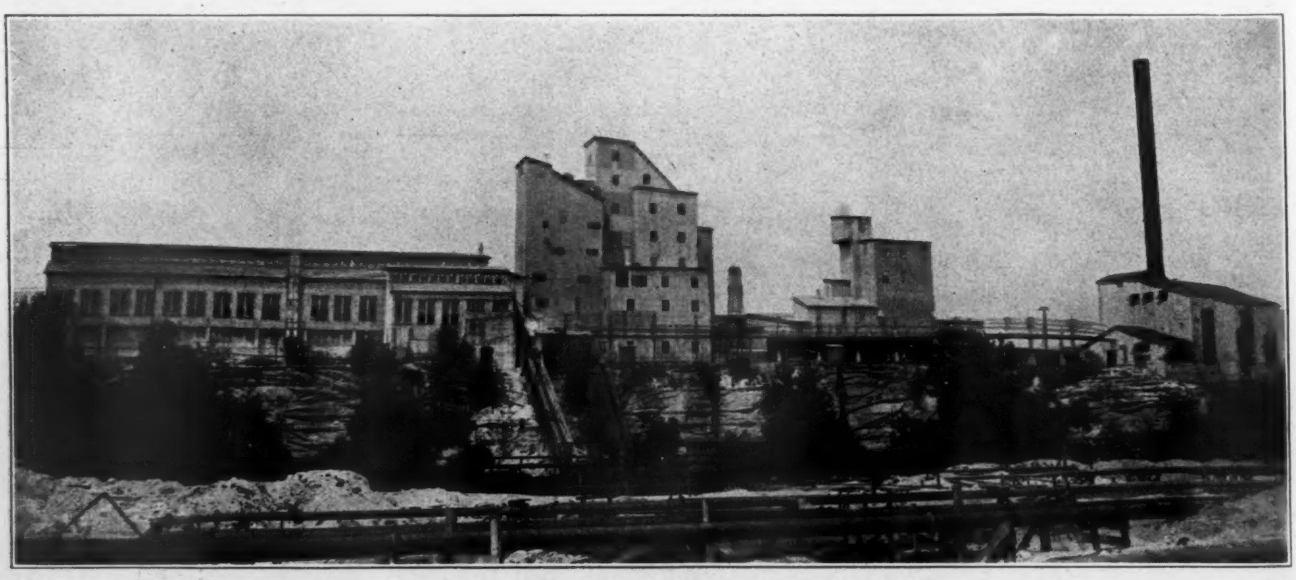
Sufficient sand is mined, pumped and conveyed during the day shift to keep the remainder of the plant busy for the twenty-four hours.

From the elevator the sand passes through a rotary screen which removes any large particles and foreign matter. The sand next passes into the first gravity washer. There are two of these, placed side by side, so that one is filling while the other is settling. In these washers the sand goes to the bottom and water carries off the foreign matter that is present in a light powdery form. This water, which is milky in color, is led to a settling basin from which it emerges as clear water to be carried through the company's 18 inch tile drain to the river which is about a mile from the plant.

The sand is again washed in a second set of washers after which it is pumped to the drain bins by a pulsometer pump. As the sand enters the drain bins, it is again washed by a jet of water and also by a spray of water which falls on it from perforated pipes placed entirely around the bins. The water used for washing the sand is obtained from an artesian well, drilled by this company, at a depth of 1,062 feet. An American deep well pump drawing 500 gallons per minute from the well gives sufficient pure clear water for thoroughly washing the sand.

The drain bins, of which there are four at Plant A and six at Plant B, are constructed of reinforced concrete 38 by 38 feet and 14 feet deep, each holding approximately 900 tons. The bins serve a double purpose, to provide a storage of material for the mill and to drain off a large percentage of the water through gravel which is placed in the bottom of the tanks. After a period of 48 hours, the sand contains only 5 per cent of moisture, therefore reducing the work for the dryers.

The dryers are placed along one side of the drain



Rear Elevaton of Plant A from Pit

bins, which are of the square type through which miles of steam pipes have been placed. The bins are hoppered at the bottom and fitted with gates through which the sand can be drawn from the dryer bin. A Williams clam shell bucket, operated by a 5 ton Pawling and Harnischfeger overhead traveling electric crane, is used to transfer the sand from the drain bins to the dryer bins.

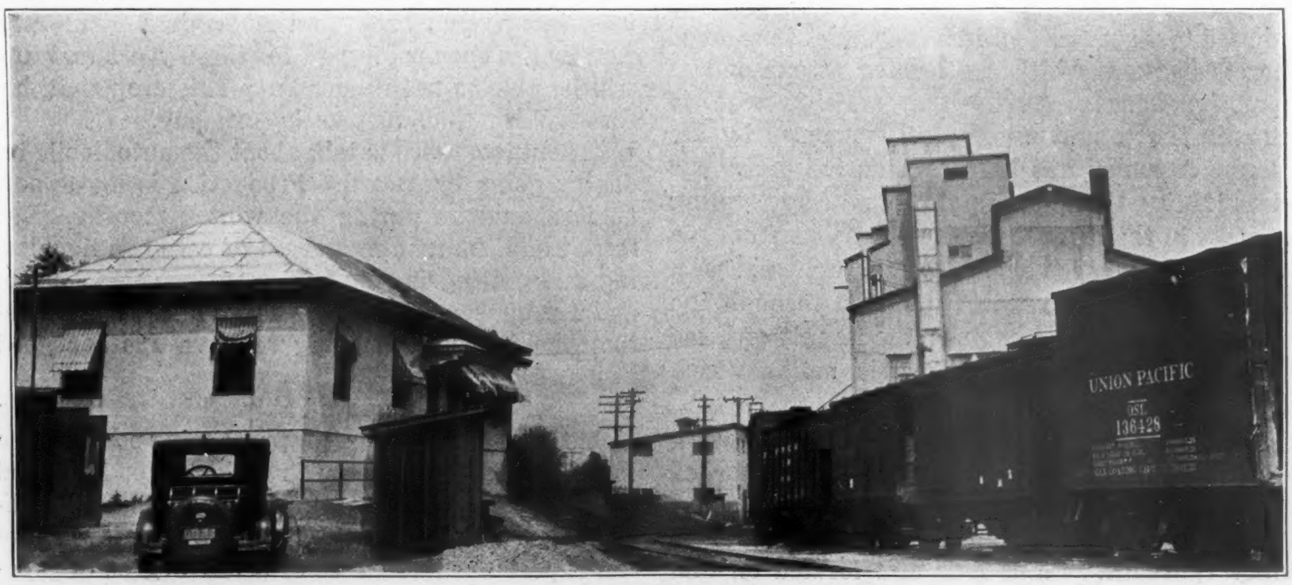
When the sand in any hopper is thoroughly dry, it is drawn off on an 18 inch belt conveyor, which travels the entire length of the building under the spouts from the dryers. This belt conveyor carries the dried sand to the cup elevator which carries it up 94 feet to the top of the building where the sand is discharged into a scalping screen which produces several main classifications of sand. These different sizes are led through chutes to a battery of tandem Hummer screens. From the Hummer screens the graded sand falls into its proper bin. Plant A has twelve and Plant B has eighteen Hummer screens. At intervals samples are taken from each screen to check the purity and grading of the sand.

In order to provide a dustless place for the men to work and also to remove any impurities which might be present in the form of powder, an elaborate dust collecting system, built by Allis-Chalmers Company, has been installed. This apparatus has accomplished the desired purpose by having each grading machine, distributing spout and storage bin enclosed with a suction pipe which leads to a dust collector. This dust is of no commercial value but its removal has provided a plant in which men may work without fear of "Silicosis" and insured a product that is more nearly chemically pure silica.

The sand is shipped in box cars with the exception of shipments made to the local plant of the National Plate Glass Company, which has provided specially constructed all steel cars for this purpose. When making shipments the box cars are first swept and then all the joints are covered with burlap, after which the car is sealed with paper. The sand is conveyed into the car from the bins through flexible spouts. The car is weighed on a Fairbanks-Morse track scale before and after loading so that the exact contents of the car is known.

Samples are taken of the sand shipped in every car so that there will be no chance for dispute as to the nature of the material which was sent. This is an additional check on the material even though the tests made during the grading operations showed it to be satisfactory. In order to meet the demand for finely ground silica, a West pulverizing or tube mill has been provided. This mill is operated by a 100 h.p. General Electric motor and is located in a building alongside the grading building. Ottawa sand has been chosen as the standard when making tests of cement and also for comparing the different sands used in concrete throughout the country. Therefore this company takes particular care with this "Standard Sand," as it is called, which must pass a 20 mesh screen and be retained on the 30 mesh, with not more than an allowance of 2 per cent variation. Kombs gyratory riddles are used for the production of this grade of sand. The sand is first passed through the 20 mesh and then shaken for a time on the 30 mesh, after which it is sacked for distribution.

The new power plant used by this company is one of the best in this section of the country. It is equipped with four 312 h.p. Sterling tube boilers fired by Combustion Engineering Company's Type E stokers. These boilers are equipped with Bailey boilers meters, Fessenden-Ellis damper regulators, National Registering Company's forced draft control, and Norther Equipment Company's water regulators. The water is prepared for the boilers by being passed through Dodge Manufacturing Com-



Office at Left. House in Center is Where Concrete Testing Standard Sand is Prepared and Sacked for Shipment. Washing and Grading Plant A at Right

View of a Sample Bag of Standard Sand

pany's soda ash lime softener and excelsior filters in connection with a Cochrane Engineering Company's sand and gravel filter, heated with Cochrane heater, and weighed with a Cochrane V notch meter. Taylor Instrument Company's pressure recorder and feed water temperature recorders are used.

The coal for fuel is received in cars from which it is unloaded by a Brownhoist locomotive crane with clam shell bucket. This locomotive crane is also used to place the coal in Brownhoist reinforced concrete bunkers which are located at one end of the power house. A traveling scale is used to ascertain the weight of the coal consumed by the boilers. A tunnel has been constructed under the boilers leading to the old sand pit and cars running on tracks in this tunnel receive the ashes from the boilers and discharge them into the old sand pits. Individual motor drives are provided through the plant for the various machines, the largest of these being a 100 h.p. General Electric motor which drives the tube mill.

The office of the company is located at Plant A, which is about a mile west from the center of Ottawa on a joint line of the Chicago Rock Island and Pacific and the Chicago, Burlington and Quincy railroads. Plant B is also located on this same railroad line. Mr. E. B. Thornton is president of the company; Mr. H. C. Thornton, vice-president; Mr. P. S. McDougal, general manager; Mr. J. B. Herring, executive chairman; Mr. G. A. Thornton, secretary and treasurer, and Mr. E. O. Schneider, sales manager. Mr. Joseph Gyger is plant superintendent assisted by Mr. W. B. Gyger as assistant superintendent.

Clear Skies and Smooth Sailing Predicted by Chicago Banker

Clear skies and smooth sailing are ahead for business, in the opinion of Arthur Reynolds, president of the Continental and Commercial Banks of Chicago. In an interview recently Mr. Reynolds said:

"For the last two years we have had intermittent periods of public despondency, whereby people began to worry about the future of business and wonder if a depression might not be immediately ahead. At no time has there been any ground for such fears and there are not now. Building has slackened up, yes, but other industries have picked up to almost take up the slack. We cannot expect the volume of business to be maintained at the high levels of 1925 and 1926, which were the biggest years we ever have seen, but we can anticipate a normal margin of profit that will produce very satisfactory results. The period of adjustment is over and debts have been pretty well liquidated, so that there is no longer the necessity of the manufacturer, the merchant, or even the consumer writing off a large part of his profits. On a smaller income all have a larger margin for surplus, and therefore a greater buying power than in past years, in proportion to their income, because there is not the necessity of paying debts or incurring losses.

"Don't overlook the fact that we still have a high purchasing power. The crops are made and in now and we can judge pretty accurately what the farmer will spend next year. The yield is somewhat smaller than a year ago and prices slightly less, but we go back to the original idea. The farmer has been paying off for three years now and will be able to keep more from this crop than before. With that surplus he can buy.

"Then, too, there is talk about the automobile industry going backward. Production is lower now as it should be during the winter months. But meanwhile the manufacturers of cars are liquidating and getting in shape to go ahead next spring, and I prophecy that they will go ahead. The automobile industry is going to have another good year in 1927.

"Labor is well employed at good wages and on a stable wage level. (There is purchasing power there too. The textile industry is picking up, here and there other businesses are picking up and with inventories generally down to pretty low levels, we can expect a maintenance of a fair degree of prosperity as far ahead as I can see. By no stretch of the imagination can I get pessimistic about 1927."

CONSOLIDATED STONE AND SAND COMPANY APPLIES MODERN METHODS TO PLANT

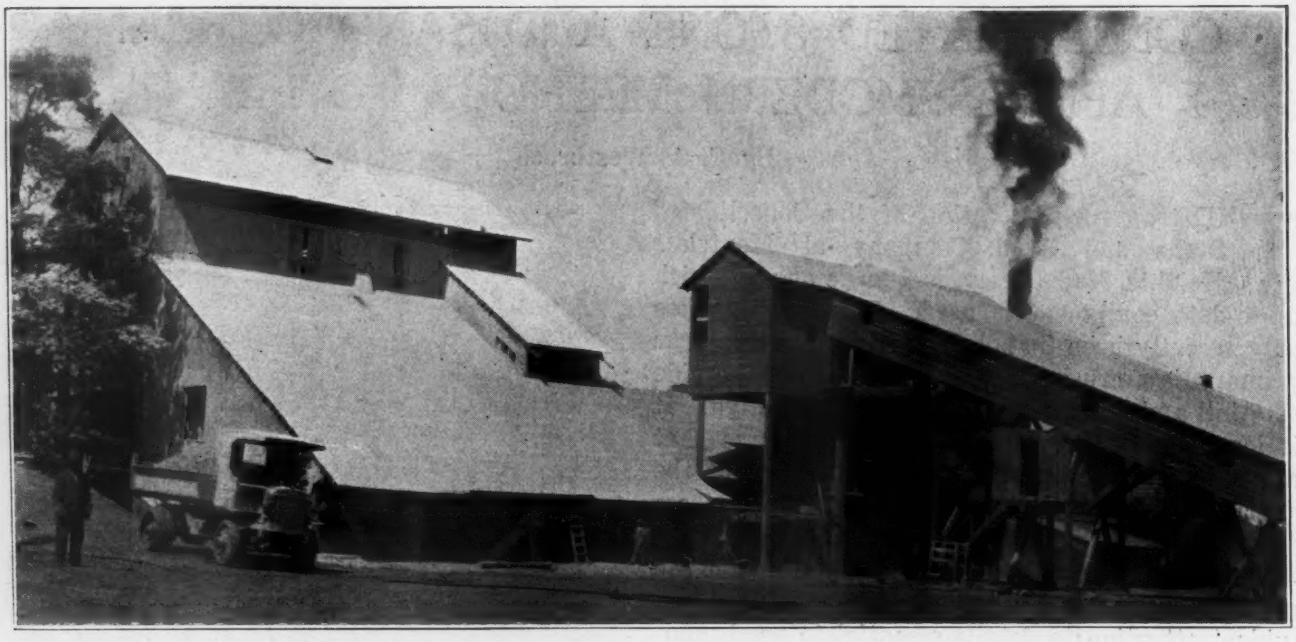
By F. A. Westbrook

THE trap rock operation of the Consolidated Stone and Sand Company at Montclair Heights, New Jersey, is a large one in which up-to-date equipment is used. Some of this has only recently been installed, particularly the large primary jaw crusher. The quarry is in the side of a hill and has a breast about 100 feet high. It is located adjacent to the Erie Railroad so that rail shipments are easily made. The floor of the quarry is kept smooth and level and free from pieces of rock to facilitate the operation of trucks and shovels. It should be said in passing that the whole operation is characterized by neatness and evident attention to details essential to good management, for which Mr. William Shaw, superintendent, must be credited.

Drilling is done by electric Keystone and Sanderson Cyclone drills. The holes are made about 107 feet deep which is somewhat below the level of the floor of the quarry, in order to break off the rock at the floor level. The spacing between holes is 20 feet and the distance back 20 feet. The dynamite used for blasting is part 60 per cent and part special slow Hercules. Blocks which are too large are drilled with Ingersoll-Rand jack hammers and then broken. An Ingersoll-Rand compressor supplies air for operating the hammers. A Marion 1 yard and two Erie ¾ yard steam shovels are used to pick up the rock. These shovels load the rock on Autocar trucks which take it to the

Breast of Quarry Showing Steam Shovels at Work and Drill at Top of Deposit

Shovel Loading Truck at Breast of Quarry



View of Plant. Conveyor from Primary Crusher at Right. Truck Backing up Over Aggremeter at Left.

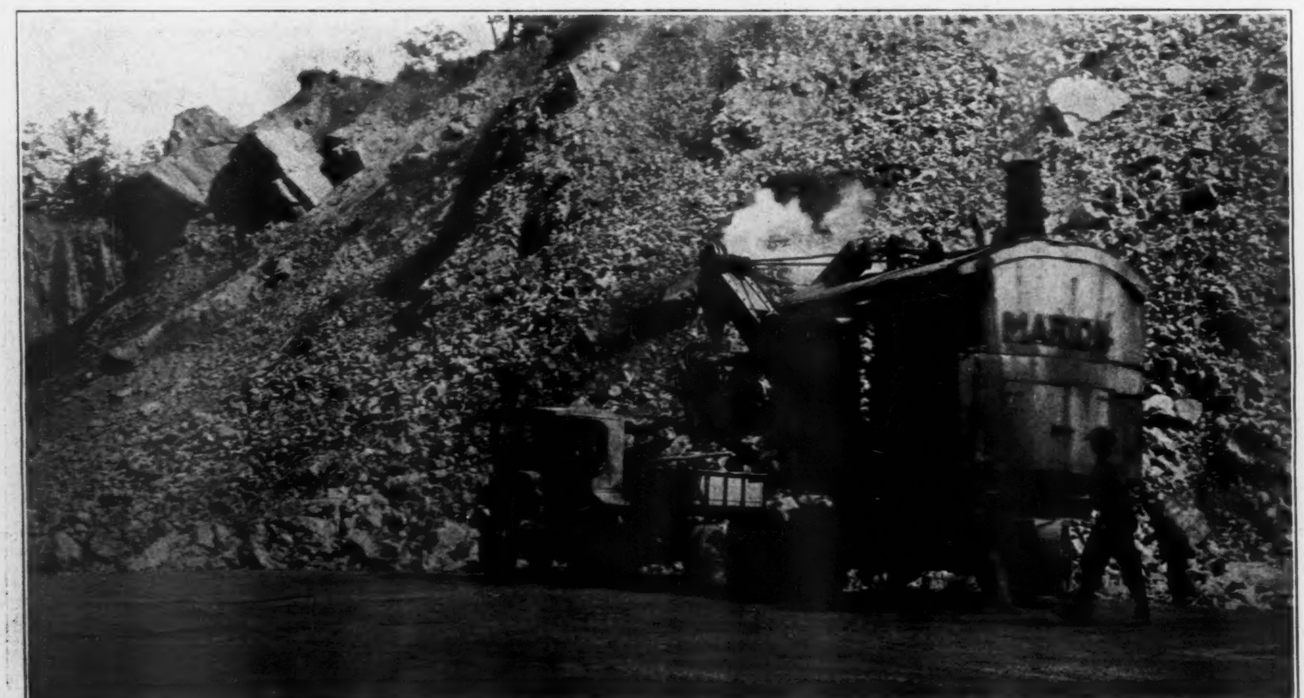
primary crusher.

There are four of these trucks in service, and these are proving satisfactory as shown by the fact that they are now in their fifth year. The trucks carry a load of 4 to 5 tons each trip and make as many as one hundred trips a day. The short wheel base of this type of truck enables it to turn in a short radius and this in conjunction with the dumping arrangement make the truck very useful for quarry work.

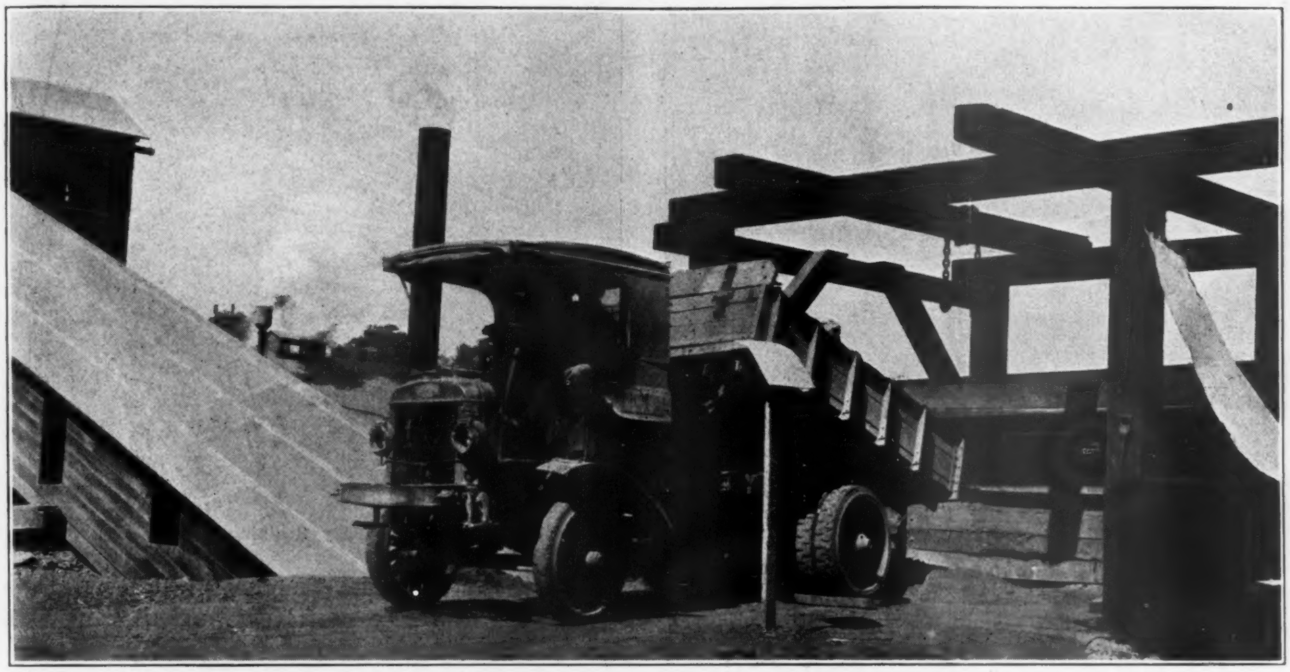
The primary crusher is a 60 by 42 inch Farrell jaw crusher and is located on the quarry floor, as near the center as practicable. From the crusher the stone is taken by a 36 inch Robins conveyor, equipped with a New York Belting Company's belt, 157 feet between centers, to the 26 foot by 48 inch first scalping screen. This screen was made by the Earl C. Bacon Engineering Company. The screen is equipped with two jackets and separates the different commercial sizes as follows: 2½ inch, 1½ inch, ¾ inch and ½ inch plus dust. These are deposited in a set of separate bins.

There is a large quantity of tailings at this stage and these drop through a chute to the secondary crusher, a 36 by 30 inch Farrel jaw crusher. Formerly this was the primary crusher but due to increase in business, a larger primary crusher and scalping screen were recently added. The crushed stone from the present secondary crusher is taken to the secondary scalping screen on a 30 inch Robins belt conveyor.

This screen divides the material into three parts,



Loading with Steam Shovel



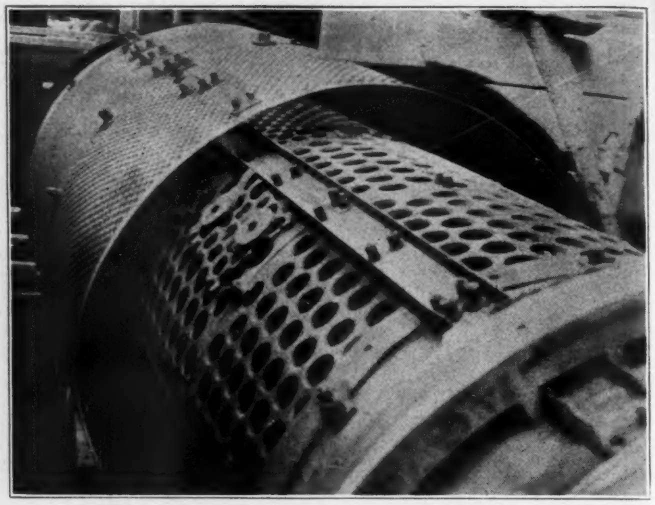
Truck Dumping Load at Primary Crusher

namely: ¾ inch and under, ¾ to 2½ inch and tailings. The ¾ inch and under is elevated by a Robins elevator to a Good Roads Machinery Company screen, where it is separated into ¾ inch, ½ inch and dust. These three grades are deposited in separate bins. The sizes between ¾ inch and 2½ inch are taken in an Earl C. Bacon Engineering Company elevator to the tertiary scalping screen. However, so far as this material is concerned, the tertiary screen is of no service but its use will be apparent later. The tailings from the secondary scalping screen are taken on a Robins conveyor to a set of two 26 by 10 inch Farrell jaw crushers.

From the tertiary crushers the crushed stone drops on a Robins conveyor which discharges into the elevator leading to the tertiary scalping screen. Thus the crushed stone from the tertiary crushers becomes mixed with the ¾ inch to 2¼ inch sizes from the secondary scalping screen. This mixture then goes to the tertiary scalping screen which takes out everything of 2½ inches and under. The oversizes, or tailings, drop back through a chute to the tertiary crushers. The commercial sizes are taken in a Bacon elevator to two 48 inch by 26 foot Allis-Chalmers screens, which are equipped with three sets of jackets. Seven sizes are separated by

Truck Loading at the Aggregmeter

View of the Gyratory Crushers



The Secondary Scalping Screen

these screens—dust, 3/8 inch, 1/2 inch, 3/4 inch, 1 1/4 inch, 1 1/2 inch and 2 1/2 inch. These sizes are dropped into separate bins.

As the demand for 2 1/2 inch material is not always sufficient to use all that is manufactured, provision has been made for recrushing when desirable. This 2 1/2 inch material is carried by a Robins conveyor placed under the 2 1/2 inch bin to a set of two Traylor Bull Dog gyratory crushers. The stone from these drops on the same conveyor used for the discharge from the tertiary crushers and is thus conveyed to the large final Allis-Chalmers sizing screens. New York Belting Company's belts are used for the conveyors and a number of Sirocco belts for the power transmission. Crescent fasteners are used on both types of belts.

Storage bins have been arranged so that the stone may be loaded into the company's Autocar trucks, to serve the Erie Aggremeter plant which is installed near the bins. This plant has proven a great success, especially for supplying the contractors who are doing state road work.

A Haiss loader is also used for loading trucks from outside storage piles, which accumulate at various times, although during the busy season it seems to be more a question of keeping up with the demand than how to handle a surplus. This in spite of the fact that the output from the plant is from 800 tons to 1,200 tons a day. The very neat and attractive office building is shown in one of the illustrations. Outside the office is a Meyer scale for weighing trucks. The plant is located near to the operations of the Little Falls Sand and Gravel Company and the Cedar Grove Sand and Gravel Company.

Rear View of the Primary Crusher

Loading Storage Piles on Floor of Quarry

IMPORTING FOREIGN CEMENT AND EXPORTING AMERICAN PROSPERITY

IN A STATEMENT forwarded to President Coolidge on November 13, H. Struckmann, president of the International Cement Corporation, which is now one of the world's largest cement producers, with eleven mills in North and South America, asserts that the consumption of ten million barrels of foreign-made cement in this country since 1920 has resulted in a loss of $29,000,000 to American industry and says that the growing use of foreign-made cement and other bulk commodities, produced abroad by low-priced labor, threatens to become a brake on American prosperity.

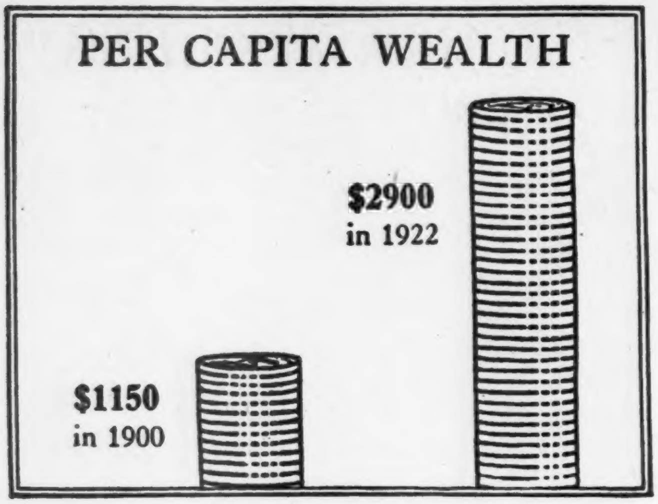
It is stated that the cement industry has lost $16,000,000, the largest single item of which is wages and salaries, the coal industry $1,462,500, power companies $1,700,000 and the railroads $7,182,400, and that the entire range of American industry is affected by the losses incurred through the use of the foreign-made product. The statement, which is being circulated among cement consumers, engineers, architects and public officials under the title, "Importing Foreign Cement and Exporting American Prosperity," reads in part as follows:

"Since 1920, users of cement in the United States have purchased approximately 10,000,000 barrels of foreign-made cement. This represents a loss to American business amounting to $29,000,000 including a net loss of $16,315,600 to the cement industry, the largest single item of which is wages and salaries; a loss of $7,182,400 to American railroads; $1,462,500 loss to coal and oil companies; $1,700,000 loss to power companies, and correspondingly important losses to sack manufac-

Where the Imported Cement Came From

Listed in Barrels by Countries

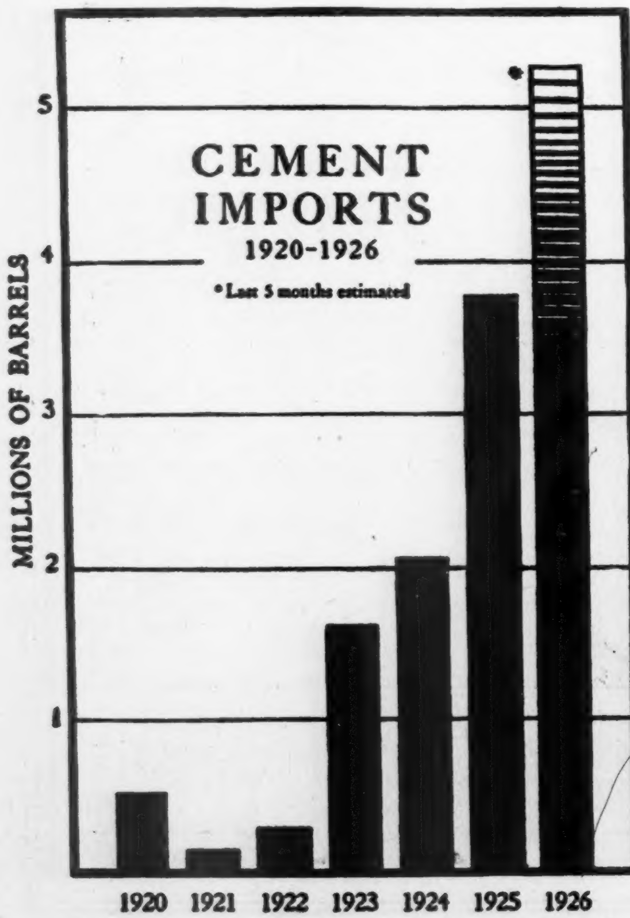
Imported From	1922	1923	1924	1925	1926 (to Aug. 1)	Total
Belgium....	10,682	200,718	1,021,213	1,919,239	1,567,250	4,719,102
Canada....	127,216	228,594	42,953	711,053	62,357	1,172,173
Norway....	125	420,233	532,089	593,621	47,375	1,593,443
Denmark ..	118,499	370,410	346,354	351,484	347,450	1,534,197
Sweden....	60,492	211,555	15,466	..	..	287,513
England ...	12	186,152	28,852	6,160	62,027	283,203
France.....	1,668	1,703	5,451	12,450	48,094	69,366
Germany...	..	47,344	11,957	16,961	5,284	81,546
All others..	5,129	11,927	6,601	44,349	94,966	162,972
Total....	323,823	1,678,636	2,010,936	3,655,317	2,234,803	9,903,515



Per Capita Wealth in the United States Has Just About Trebled in the Last Generation

turers, cotton growers, explosive manufacturers, manufacturers of miscellaneous supplies and repair parts, and to the American gypsum industry.

"Approximately 50 per cent of the total quantity of imported cement comes from Belgium. Cement mill labor in Belgium gets the equivalent of 90 cents gold a day. American cement is made by men receiving five times as much, that is, $4.50 a day. Cheap labor, together with low cost fuel, the principal items in the cost of cement manufacture, have resulted in the production of large quantities of foreign-made cement for export. A great deal more cement is produced in Europe than is required for local consumption, and low canal tolls from inland points in Belgium, France and Germany, together with cheap ocean freights to this country, enable the foreign manufacturer to undersell the American producer.



"The statement is sometimes made that by purchasing the foreign-made product, we are indirectly helping Europe to get back on her feet. It is important for Americans to understand, however, that we cannot help Europe by hurting American business. The net result of that attitude would ultimately mean just one thing, reducing our living standards to a level with theirs. That in effect is what is being done when we send $29,000,000 worth of American prosperity abroad in exchange for 10,000,000 barrels of foreign cement. That amount of money or its equivalent has gone out of the country and practically every industry in this country has been directly or indirectly affected as a result.

"First there was the loss to the cement industry of approximately $16,000,000, the largest single item of which is wages and salaries. That is a sizeable item and it means lessened purchasing power of American workers who would have earned this money. That in turn means reduced business all along the line.

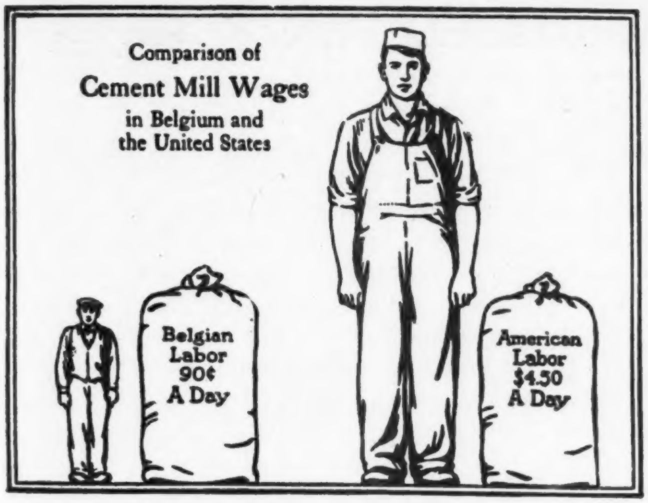
"But that is only a small part of the loss to this country. American coal and oil companies lost the sale of 650,000 tons of coal or its fuel-oil equivalent. That is about $1,462,500 more out of the American pocket.

"Then, there is the loss of $1,700,000 which would have been spent for power in producing this cement. Gypsum mines lost $199,500 worth of business; manufacturers who furnish parts and sundry supplies to cement mills lost sales amounting to $1,000,000.

"But that isn't all. There is also the loss of approximately $7,182,400 to American railroads—$6,350,000 on the transportation of cement, $650,000 on coal, $182,400 on gypsum, and a substantial sum on sacks, parts and other material, as well as a loss to sack manufacturers of $960,000, while the makers of explosives lost $130,000.

"The greater part of these sums would have gone into wages and thence have been converted into business for those who make and sell the necessities and comforts of life, so it is obvious that practically the entire range of American industry is adversely affected. Then, the Governments, both national and state, lose revenue because of the reduced taxable income, and that loss results indirectly in higher taxes on a smaller volume.

"All this definitely affects prosperity. It may not have been noticed while things were booming along at record-breaking levels, particularly in the



Full-time Employment at Good Wages is a Vital Factor in American Prosperity

construction industries. But it will mean better business for American industry as a whole if the cement-consuming industries remember that in reality it is their own customers who are hit every time they buy foreign-made cement.

"Since 1920 those who have purchased foreign cement made a 'saving' of from 15 to 30 cents a barrel. But that saving actually cost America $29,000,000 worth of prosperity. 'Savings' such as that are pretty expensive. The same conditions apply to other heavy commodities, such as pig iron, iron and steel products, brick, glass and the like, which are being imported in large quantities. If the present trend continues, it will mean a veritable flood of these heavier products and a real menace to American prosperity. We Americans must realize in time the paramount importance of keeping our money working at home.

"Europe is producing more cement and other heavy commodities than she did before the war. But her ability to buy them herself is considerably diminished. As long as that condition continues, this menace to American business will remain with us. America must wake up, or find her own prosperity seriously impaired.

"Money raised through taxation is being spent by city and state governments for foreign-made cement and other products, with resulting losses to the very people who pay these taxes. These governments are penalizing their own citizens, who depend upon American industries for their livelihood, just as they are handicapping industries whose capital has been encouraged to invest in their midst.

"A change in viewpoint seems slowly to be coming about. The governor of one state recently instructed his department heads to specify only American-made cement, because he saw the eminent fairness of that course both to the people of his state and to the capital which helps to provide them with employment."

Prosperity at New Record Level

With industrial production at a higher level than for the last two years, bank credit seasonally increasing and money consistently firm, the Federal Reserve bulletin for November, gave an unusually encouraging account of the nation's general prosperity and declared that a "record level" had been reached.

Production in basic industries has shown a steady increase and the wholesale price index reflects advances for September both in non-agricultural and agricultural commodities, the bulletin says.

"Taking the first ten months of 1926 as a whole," the bulletin says, "the volume of bank credit in the United States continued to increase as in other recent years, but at a much less rapid rate. The higher level of commercial loans during the current year and the increase in these loans during recent months have reflected in part a generally higher level of industrial production."

Continuing the bulletin says: "The board's new index of the physical volume of industrial production which is more comprehensive than its old index for so-called basic industries has been higher every month this year than in either 1925 or 1924, and for the last two months has been at a record level. The rise to a new high level in September, which is the latest month for which comprehensive statistics are available was largely due to exceptional activity for this season of the year in the mining of bituminous coal and to a recent marked increase in the manufacture of cotton and woolen textiles."

Missouri Valley Association Plans Annual Meeting

The Missouri Valley Association of Sand and Gravel Producers which includes the producers of Missouri, Kansas and Oklahoma in its membership will hold their annual meeting on December 13 and 14 in Kansas City.

The officers of this association include R. J. Stewart, president; N. C. Dunn, vice-president; F. W. Peck, treasurer, and W. E. Johnson, secretary.

A Court of Homes

"A Court of Homes," featuring an artistic grouping of a number of full sized homes built in the various accepted and proper materials, will be a feature of both the New York and Chicago "Own Your Home Expositions." This exhibit is being planned in a way that will interest architects and builders, as well as prospective home owners. The houses will be of concrete, masonry, brick, frame, stone and other materials that have demonstrated their worth, permanency and economy.

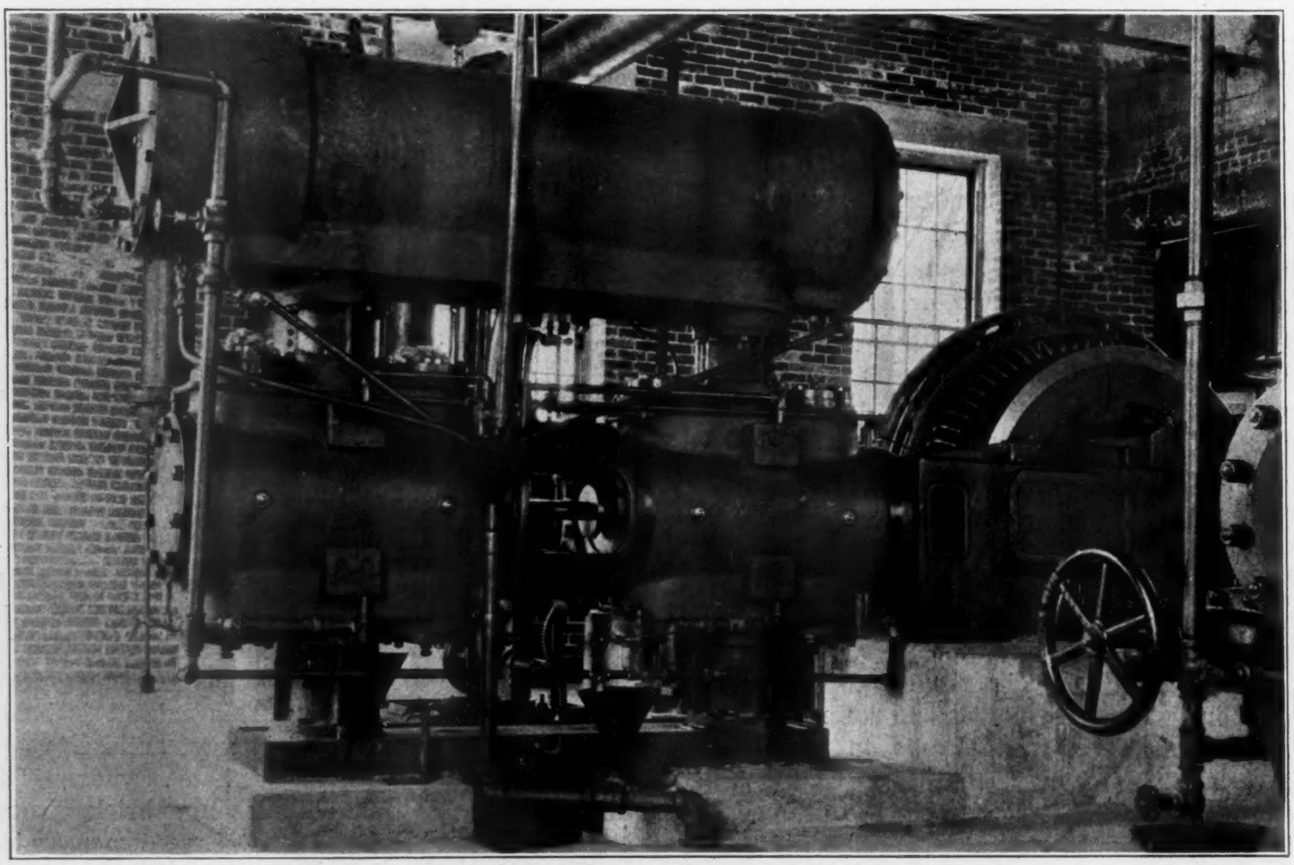
CENTRALIZED UNIT COMPRESSED AIR PLANT REDUCES OPERATING COSTS

By George Ransom

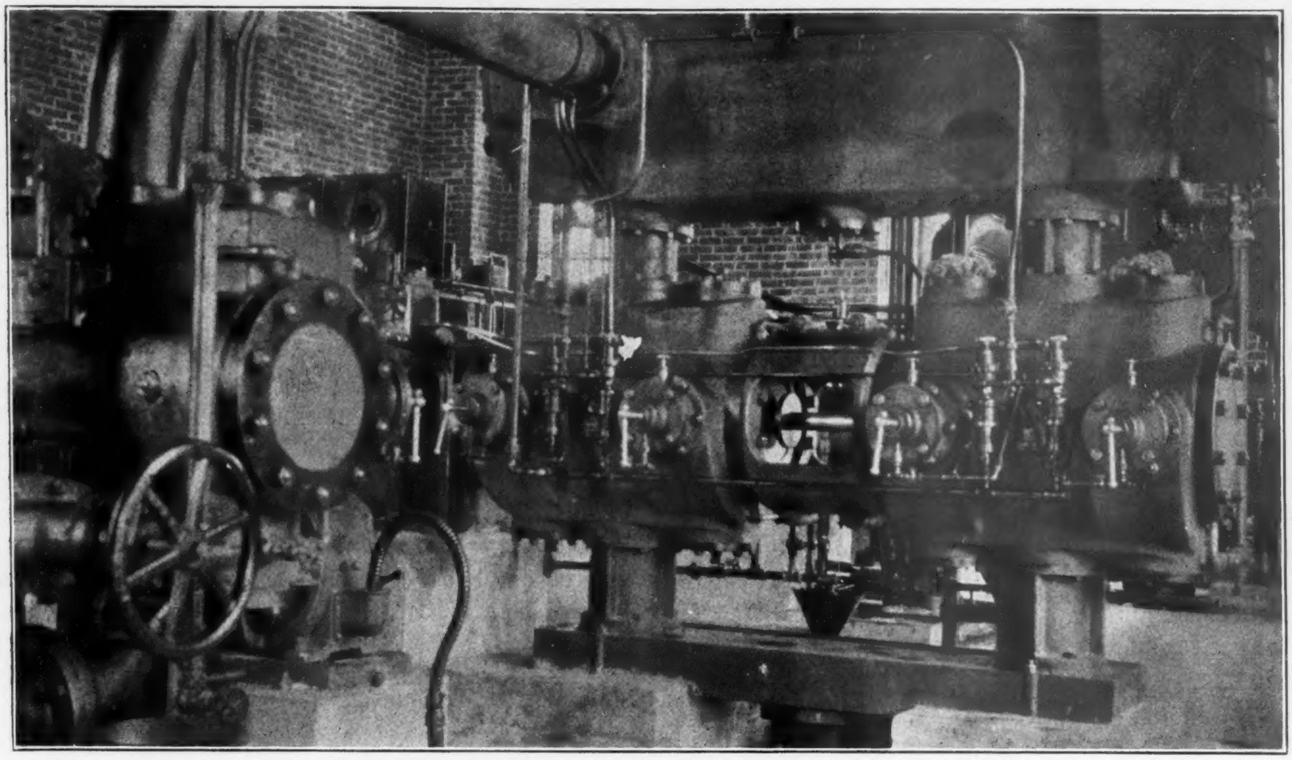
THE Vermont Marble Company has recently completed the installation of a unit centralized air compressing plant with air pipes, to the different quarries at its West Rutland, Vermont, plant. This has resulted in reducing the operating costs approximately $14,000 a year over the old method. This installation is the outcome of an exhaustive study and very able analysis of the drilling problem made by Mr. W. D. Gordon, one of the Marble Company's engineers. This investigation applied to the drilling of marble as experienced by this company, but the method of approach as well as some of the results will probably be applicable in other cases.

The object of this installation and the reasons for the change, which will be analyzed later, was the substitution of jack hammers for the old fashioned 5B Temple drills. Experience has shown that for drilling marble, it is more efficient to use jack hammers than Temple drills for the following reasons: They cut a dry hole which makes for better working conditions and eliminates much difficulty from freezing during winter; they can make deeper holes and little difficulty is experienced in cleaning the holes; a bar or mounting is not always necessary with jack hammers, which, because of the small operating room required, makes them usable in places where other types of drills cannot be employed; where jack hammers must be mounted on quarry bars, as they weigh only about one-half as much as Temple drills, fewer men are required to move them; as jack hammers do not have a pulsator they are advantageous for inclined quarries; they can be used in connection with the channelling machines in these quarries to make track pin holes and holes at the ends of cuts for the channeller to run into, thus saving an expensive transfer cut and lost time between set-ups. The jack hammer may also be used to start channel cutting without delays. Another advantage is that they can be mounted in pairs and operated by one man and the company's experience has shown that he can, in this way, do 80 per cent more work in a day than with one hammer.

Although the Vermont Marble Company's records show that the 5B Temple drill and the DCR13 jack hammer will drill about the same number of feet in the same length of time, in view of the advantages enumerated, the latter are the more efficient. Calculations based on actual figures show that the cost of drilling per foot, based on a year's operation, with jack hammers is only about 55 per



One of the Compressors Showing the Synchronous Motor and Tank

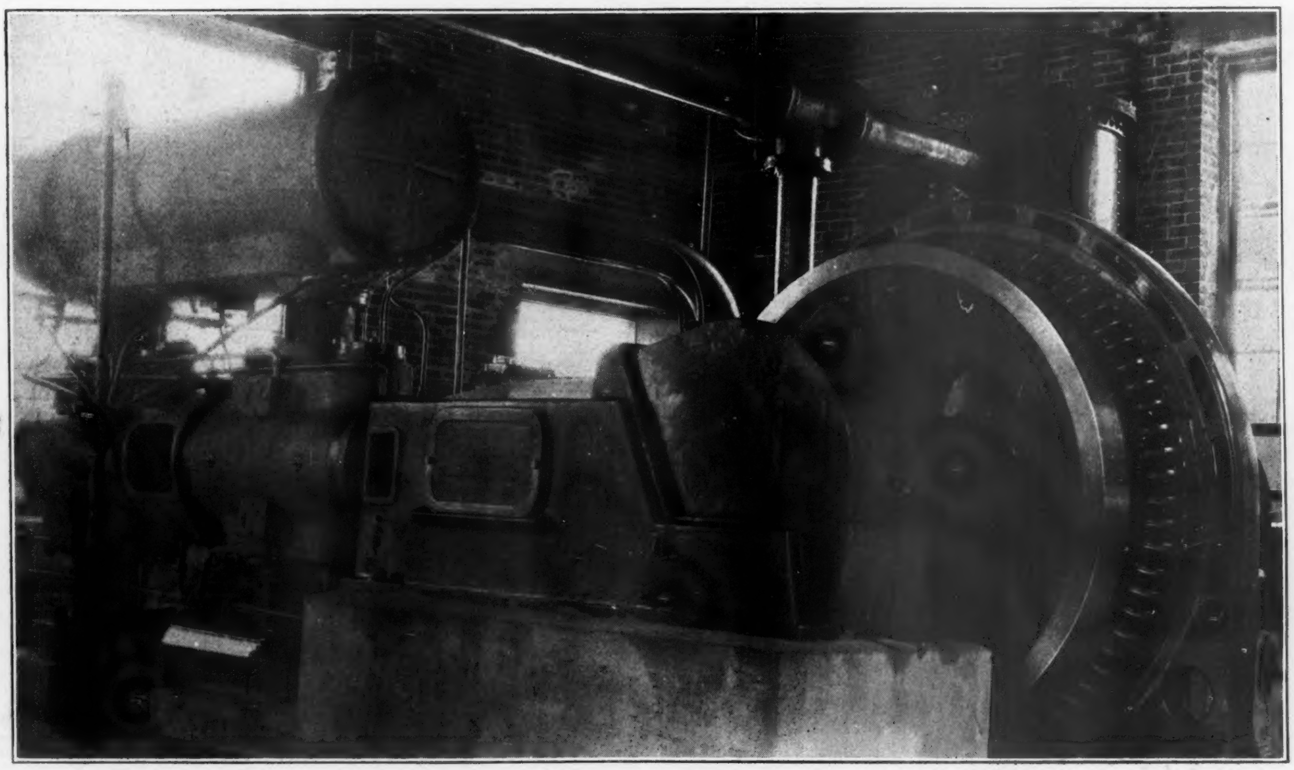


General View of the Compressors

cent that of drilling with Temple drills; and where double jack hammers are used, it estimated that the cost per foot will be only about 36 per cent.

As a result of this investigation it was decided to make jack hammers standard equipment, especially as the old equipment was worn out. The next question to decide was how the compressed air could be most economically provided to operate the thirty-nine jack hammers which it was estimated would be required for other uses, such as for the boilers, blacksmith shop, drill sharpening and chippers. Several plans were considered and reduced to annual cost per cubic foot of delivered air.

Some of the plans considered were: The use of portable mine car compressors in the six quarries to be served; large stationary units located in some of the quarries and piped to others; a unit at the surface with others in the quarries and one main plant on the surface with piping to all points of operation. Although the latter was highest in first



Synchronous Motor and Compressor With Cooling Tank in Background cost, it was very much lowest in annual cost per cubic foot of delivered air.

This also is the most practicable from the operating viewpoint for several reasons. Portable compressors as a sole dependence for air in marble quarries are not very satisfactory, because dust and dirt are injurious to the valves and wintry weather is bad as it cools the machine and oil too much. Air filters do not seem to solve the dust problem entirely although an experiment with Mid-West air filters did show some improvement. Again, large compressor units in quarries, although they can be adequately heated and the air filtered, do not have as great a flexibility for future expansions as desirable. Again there are certain times when it might de difficult to supply cooling water to the compressor without piping it down.

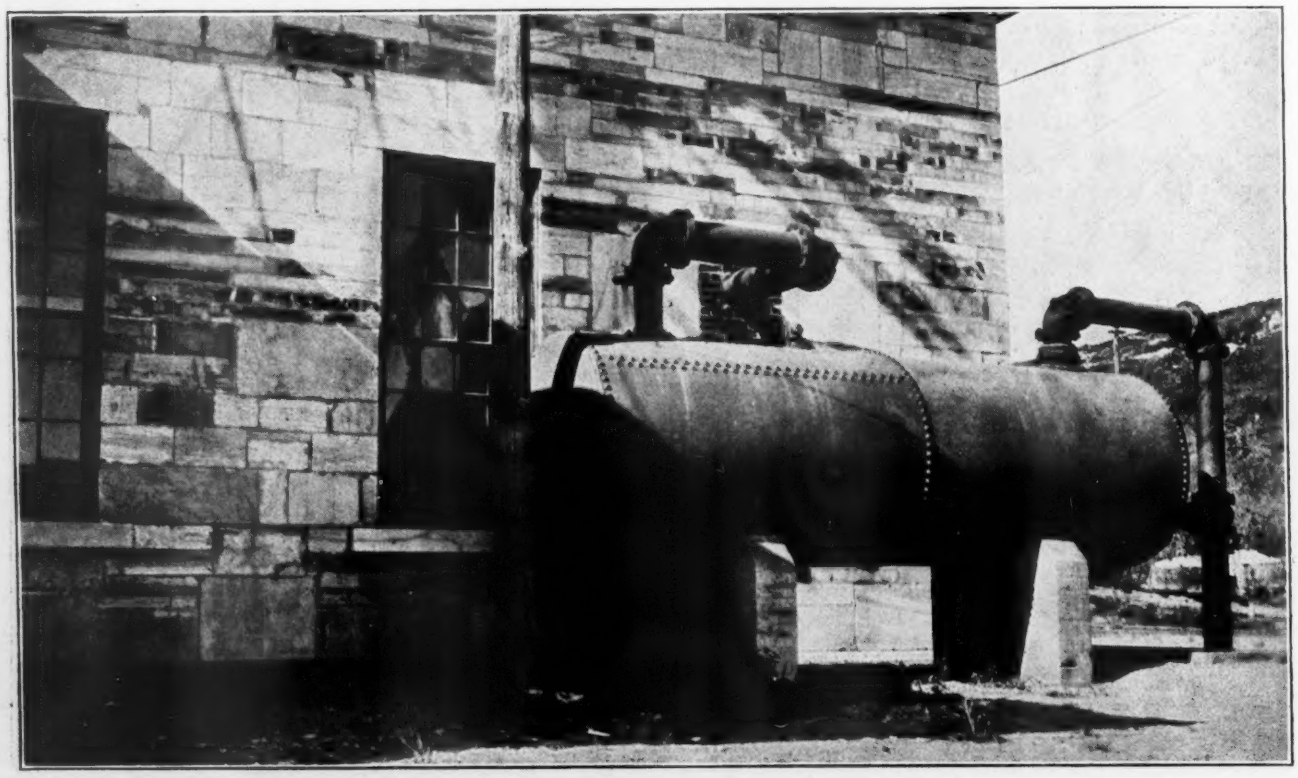
Therefore, by having a centralized plant on the surface, the air can be piped where it is needed, intake air conditions are good, cooling water is easily available and the question of attendance is reduced to the simplest possible terms. In fact, this compressor plant has been placed in a new wing, built on to the existing substation, and the man who formerly only attended to the electrical apparatus now looks after the compressors as well.

Two 14x14x12x14 inch Bury Compressor Company units have been installed. Each is driven by a 225 h.p. General Electric synchronous motor, equipped with a 7½ KW direct current exciter. The synchronous motors, one of which is running continuously day and night, help to correct the plant power factor. An after cooler is also part of the equipment. This condenses the moisture in the air so that clean dry air is furnished to the pneumatic machinery and greatly reduces repairs or interruptions and makes the operating practically the same for all the year.

One of these compressors is sufficient to carry all the present load and the other serves as a reserve in case of breakdowns and will take care of future expansion for a long time. Provision has been made to pump the cooling water back into the company's system so as to conserve water, which sometimes runs low.

In addition to a large 16 foot by 5 foot air reservoir, just outside the compressor house, there are seven others located in the quarries, as follows: Two 12 feet by 4 feet; one 16 feet by 5 feet; and four 8 feet by 3½ feet. Stockham pipe fittings have been used. With this installation, the saving will be $10,700 per year, if the drilling is all done by single jack hammers, but as it is estimated that at least half of it will be done with double hammers, this total will amount to approximately $14,000 per year.

This installation has released three Ingersoll-Rand compressors of 243 cubic feet capacity and one Bury compressor of 300 cubic feet capacity, which were formerly located at the West Rutland quarries and mills. These compressors will be taken to other quarries where they will be used to replace about fifteen Temple drills. In addition to the yearly saving of ten to fourteen thousand dollars, production of the quarries will be increased and working conditions improved to a large degree, which is of decided importance, although no attempt has been made to evaluate it.



Large Air Reservoir Outside of Compressor House

TALC

By Dr. Gutlohn*

MOST chemicals produced industrially have a definite composition. In purchasing caustic soda, muriatic acid, and borax, etc. the composition, concentration, presence or absence of impurities is known to the purchaser and he is in a position to determine the best on the basis of the corresponding composition. The situation is entirely different in the case of a large number of natural products, which enter commerce with a more or less arbitrary classification. As a result the purchaser generally, to his own disadvantage, buys these products on the basis of certain trade names which frequently give little or no true information as to the suitability and quality of the product. However, in the case of many natural products, such as coal, ores, etc., it has been found to the mutual interest of the consumers and producers to arrive at a common basis of understanding regarding their composition and quality. In the case of other products, which are difficult to define but in which the method of preparation or treatment is of importance in determining the final properties, there has been a more or less general agreement as to the varieties to appear on the market.

In other important cases, however, entirely arbitrary marking is still used so that almost every producer has his own method for classifying products. In most cases the consumer is unable to determine the actual characteristics of the individual brands, as this would involve very tedious and expensive investigations. He is, therefore, compelled to order a brand, arbitrarily selected from the same producer, as he would be compelled to undertake new investigations and suffer factory difficulties if he were to change to some other brand, just as arbitrarily defined. This method produces a very inconvenient limitation and lack of freedom in purchasing and offer decrease in productivity.

It is to the advantage of both the consumer and producer to arrive at suitable specifications for all these products which should be arrived at by open discussion between all the interested parties. Such a product in which a suitable determination of properties appears necessary is talc.

Pure talc is the acid sale of metasilicic acid of the formula $H_2Mg_3Si_4O_{12}$. Its hardness is 1, its specific gravity 2.6-2.7, it is soft and greasy to the touch and is not decomposed by acids. The color is pure, either a bluish gray or yellowish white; it is fusible only at very high temperatures. These properties have given talc a series of commercial applications: in the textile industry as a dressing and finishing material, in paper manufacture as a filler and also as a satinizing agent. In the rubber industry for various articles, insulating tubes, dusting of forms, etc.; the glass, iron explosives, telegraph, artificial stone industries use talc in large quantities for the most varied purposes. In the preparation of pastes, glues, sizes, polishes, pomades, cosmetics, powders, soaps, lubricants as well as in other branches of the chemotechnical industry talc finds many applications. Light, fire and weatherproof paints are produced by special processes with talc. There are many other fields of usefulness which might be mentioned and undoubtedly talc will also find other new fields.

The varieties of talc appearing in commerce contain in most cases impurities, to a greater or less extent, which limit its usefulness for various purposes or make it unusable although pure talc without the impurities in question would be applicable in all cases. These impurities usually arise from the rocky formations from which the talc is obtained. Of these numerous impurities we will point out only a particularly high content in limestone, magnesite, barium sulfate and iron oxide. As the word "talc" does not refer to a strictly defined concept, it is possible for producers to mark materials as talc whose composition and properties have nothing in common with pure talc. The classification of these products depends generally on external characteristics as, for instance, the color in which case the purchaser may make the unpleasant discovery that an especially "pure" talc graded with a number of zeros may contain injurious constituents such as calcium carbonate (chalk) or barium sulfate (heavy spar). Of the numerous difficulties produced by impurities a few will be mentioned. In the cable industry the insulating value of pure talc is of great importance. If the talc contains considerable quantities of non-insulating impurities it is without value for this purpose. In the textile industry pure talc is advantageously used for the finishing of fabrics; talc containing substances of high specific gravity (heavy spar) decomposes the finishing material. Furthermore talc containing lime is unsuitable for finishing purposes. In the soap industry, talc is still used as a filler in which case it should be noted that impurities such as lime, magnesite and iron oxide slowly react with the soap and after a longer or shorter time produce unpleasant effects. This recital of the undesirable incidental effects of the impurities in talc could be greatly extended. A comparison of the analytical figures for various types of talc of relatively pure composition shows that the nature and quantity of the impurities varies within large regions. In order to make it

*Chemiker Ztg. No. 90, Sept. 22, 1926.

possible for talc consumers to be clear as to the important constituents of the variety of talc in question, it would be absolutely necessary for each producer of talc to furnish his customers with the guaranteed analytical data for his various products so that the purchaser could make his decision on the basis of composition as well as on the subjective determination of color, feel, fineness, etc. This information is supplied by one Austrian firm and these data are given in the following table:

Variety of Talc	000/U	00/V	0/W	I/X	II/Y	III/ZN	IV/G
Spec. Grav.	2.75	2.66	2.65	2.53	2.75	2.74	2.69
	Per cent						
Water	0.05	0.09	0.08	0.15	0.16	0.21	0.32
Volatile	4.85	5.36	5.20	6.53	6.35	7.28	9.48
Silica	62.00	59.94	60.45	54.04	55.25	51.28	42.86
Alumina	1.72	4.10	2.75	8.08	7.63	9.11	15.36
Iron Oxide	0.39	0.99	0.54	0.78	0.80	0.80	0.98
Lime	Trace	0.31	Traces		....	....	0.69
Magnesia	31.01	29.24	30.88	30.70	30.29	31.05	30.59

It is to be noticed that in the case of these varieties even the poorest contain no appreciable amounts of calcium oxide or iron oxide.

Markets for Bauxite

Bauxite finds its market east of the Mississippi River, and is sold largely to the manufacturers of aluminum, abrasives, commercial chemicals, and refractories. In 1925 the market for the manufacture of the alumina cements was largely met by imported bauxite. High-alumina (diaspore) clays produced in Missouri are being sold according to their alumina content, and three grades, containing 55, 65 and 70 per cent of alumina, are regularly handled. In the last few years some of the makers of refractories and of aluminum chemicals have been using clays as a crude material in place of bauxite.

The largest consumers of bauxite in the United States are also producers, and there is only a small market for what might be called "outside bauxite," states James M. Hill of the Bureau of Mines, in a report recently issued. Consumers who do not own deposits contract for their supplies for considerable periods, seemingly to assure an adequate supply of bauxite of the grade desired. The price of bauxite at mines or shipping points in 1925, as reported by independent producers, ranged from $5 to $6.41 a ton; the average price reported by all producers for the year was $6.28 a ton f. o. b. mines. Consumers, on the other hand, report prices that average $12.50 a ton f. o. b. plants, a little lower than in 1924.

Crushed bauxite was quoted at $5.50 to $8.50 a ton throughout 1925. Dried and pulverized bauxite was quoted at $14, and calcined bauxite at $19 to $20 a ton f. o. b. shipping point. French and Adriatic bauxite was offered at $4 to $7 and Guiana at $8.50 c. i. f. American ports. Under the tariff act of 1922 crude bauxite is dutiable at the rate of $1 a ton, and alumina hydrate or refined bauxite at half a cent a pound.

Another Borax Find in California

In these days, when many people are saying that the "old prospector" is a relic of the past and that we can get along without him, it is well to be reminded that he is still a useful member of the mining fraternity. It was the keen eye of a prospector a few years ago that noticed a 3-foot exposure of light-colored shale in a gulch otherwise strewn with gravel and boulders, north of Red Mountain, near the little settlement of Shoshone, in Amargosa Valley, California. He was looking on the east side of the valley for a deposit of so-called "fuller's earth," or "bentonite," such as is found in the lake beds on the west side near the same place. On closer inspection he discovered embedded in the shale a few small lumps of crystalline material which proved to be colemanite, the principal ore of borax. This deposit was bought by the Pacific Coast Borax Co. soon after its discovery and is now being actively mined. The ore body has proved to be unusually large and rich. This mine was visited in November, 1924, by L. F. Noble, a geologist of the Geological Survey, Department of the Interior, who was given an opportunity to view the workings and examine the deposit. His brief report, which includes also an account of the general geologic features of the neighboring region, has just been published as Bulletin 785-D.

Twenty-two Nations Invited To Chicago Road Show

Twenty all Latin-American nations have been invited to participate in the 1927 Road Congress to be held in Chicago during Good Roads Week, January 10th to 15th. The meeting is to be the 24th annual convention and road show of the American Road Builders' Association. Invitations were extended Presidents of all South American Republics to appoint official delegates to the Convention. The foreign delegates will be honored with a Pan-American Day, according to H. G. Shirley, President of the Association.

"The increasing interest of the Latin-American countries in the building of roads has made it essential that representatives of these nations assemble in such a meeting as the American Road Builders' Association has called for Good Roads Week," Mr. Shirley said. "During that period the visitors may absorb the better points of highway development in this country and apply them to construction in their own land.

"Brazil and Mexico, the two nations now leading in the construction of roads in Latin-America, have approximately 50,000 miles of highways. Of this mileage only about three thousand is improved. Plans now under way, however, call for the expenditure of millions in paving the more important highways."

A PICTURESQUE WHETSTONE QUARRY

By F. A. Westbrook

INVESTIGATION of different types of operations in the non-metallic mineral industry is interesting for a variety of reasons. It may be the machinery, an unusual process, very complete material handling or other details appealing to engineers and practical men. But sometimes one of these operations is located in such very beautiful scenic surroundings that the impression made by these surroundings is more lasting than any other. That was my experience in visiting the whetstone quarry of the Pike Manufacturing Company at Westmore, in the extreme northern part of Vermont.

The village of Westmore is situated on the shore of Willoughby Lake which lies in a deep valley with mountains rising precipitously from the water. The quarry is in the wooded hills, a short distance beyond the north end of this lake. The approach is along a winding road following the shore line. My visit was on one of those September days when the sky is dark with high black and gray clouds, giving the water a dull leaden color and making the mountains look almost as black as the clouds. After passing through such country as this, one could hardly be expected to be in a very technical frame of mind.

To reach the quarry, it was necessary to leave the excellent main highway near a farm house, and drive along a so-called road through a rocky pasture

Part of the Bottom of the Quarry Looking Down into Worked Out Portion

Views of the Mountains Rising from Willoughby Lake

Discharging a Load of Waste into Old Part of the Quarry

Unhooking a Block from the Steam Derrick after it has Reached to Surface

and finally up a steep wooded hill. It seemed best to walk the last quarter of a mile for obvious reasons.

The fact that this quarry is in such a wild and unspoiled place might give the impression that it is a new development. Nothing could be farther from the truth, however, as it has been worked for the last sixty or seventy years.

The method of operation is rather peculiar because sufficient stone can be quarried during about two months in summer time to keep the mill at Evansville, Vermont, about seven or eight miles

Hoisting Engine House. Note Portable at Left and View of Mountains in Background.

Placing a Skip Load of Waste on the Push Car for Disposal at the Dump

Portable Gasoline Engine Driven Compressor. Jackhammer Lying on Ground

away, busy during the entire winter. The men who work in the quarry also attend to their haying in summer and then work in the mill in winter, which is very long in this northern mountain region. As the foreman expressed it, "We have about nine months of winter and three months of late fall."

To take out the stone, a certain amount of drilling is necessary. For this purpose a 550 pound steam driven Sullivan tripod drill is used and a Schramm compressed air jack hammer. A Chris. D. Schramm gasoline engine driven portable compressor is used for operating the jack hammer. However, as much of the stone as possible is wedged out. One of the illustrations shows a large piece which has been taken out in this way.

There are two derricks. One is operated by steam and used for hoisting blocks to the surface. This derrick is equipped with a Kendall hoist, steam engine and Tradeo and Smark wood burning boiler which also provides steam for the Sullivan drill. The other derrick is hand operated and is used to load the horse drawn trucks and sleds on which the stone is taken to the mill. The stone is lifted by chains with the help of the steam derrick. The steel pulley blocks used were made by the Boston-Lockport Block Company which also supplied the wire rope. Bagnell and Lowell steel blocks are also used. In the shop is a Canedy Otto forge.

Of course there is much waste in an operation such as described here, because only stone with the proper grain is suitable for the mill. This waste is placed in a skip raised by means of the steam derrick to a push car, and taken to the end of the track where it is dumped into a worked out part of the quarry.

The usable pieces are arranged in neat piles within reach of the hand derrick, ready to be taken to the mill. Moving the pieces to the mill has to be done during seasons when the roads are passable. During the muddy periods in late autumn and early spring, the roads are impassable. However, in winter, sleds can be used to good advantage and at other times horse drawn trucks are employed.

As is evident, the operations are simple and there is not much machinery. Still, a visit to the quarry leaves a recollection of pleasure and profit. Places where this kind of stone is quarried are not numerous in New England and the country passed through, to reach the quarry, is most unusual in its grandeur and the views from the quarry itself are well worth the climb. Moreover, the men working at this plant extend a very warm and cordial welcome to visitors.

This kind of operation is a diversion for anyone

Hoisting a Large Piece of Rock from the Quarry

Hand Operated Derrick and Piles of Usable Rock Ready for Transportaton to the Mill

connected with the non-metallic industry because it has the attraction of combining an interesting business with pleasure. Westmore is located about fifteen or twenty miles south of the Canadian border on the main motor highway from St. Johnsbury, Vermont, to Newport, Vermont, the road extending northward past Lake Memphremagog to Sherbrooke to the quaint city of Quebec.

Installment Buying

When no less an economist than Roger Babson publicly declares that "a distinct recession in business, possibly a panic, will occur within two or three years, due to the result of overextension in the installment business, which is today eating into the vitals of business like a cancer," and with the practice becoming so universally adopted as to directly or indirectly effect practically every business or industry, it becomes necessary that we give serious thought to the situation.

It is true that few economic trends have surpassed that of deferred payments in rapidity of growth and number of transactions involved. But it is equally true that the principle of installment buying has been in actual practice for hundreds of years. Those Europeans now rightfully classed as "ancients" knew how to sell a house with a payment of one-third down, the balance to be paid in two equal annual installments. It is from this beginning, installment buying and selling has extended itself into all manner of fields.

With the advent of the motor car and greatly augmented average earnings, deferred payment operations have become tremendously enlarged, and there has been induced research and subsequent criticism of the practice. In spite of this criticism, which can now be heard on every side, let it be said at the outset that without the principle of deferred payments the automotive industry would today be only a fraction of its present size and influence. Deferred payments in the automotive field, whether the dealer carried the installment paper, hypothcated it with his local banker, or cashed it with one of the many finance companies, has permitted and encouraged mass production—without which there could be no market for a possible 4,000-000 cars annually.

According to worthy statistics the amount of merchandise sold on the partial payment plan now totals in excess of $6,000,000,000 a year—or approximately one-sixth of the nation's total retail trade. The amount is of course colossal,—as is the 5 per cent thereof ($300,000,000) which might conceivably be saved the buying public through the payment of spot cash. In the light of the fact that life insurance has doubled its total volume in the past five years and that savings bank deposits have increased from $14,875 million in 1920 to $21,134 million in 1925, we may reasonably discount the assertion that installment buying is inimical to thrift or that it is incompatible with intelligent buying habits. But even laying aside the factors of savings deposits and life insurance business, there is yet another encouraging fact found in the American Bankers Association statement that of the $6,000,000,000 deferred payment volume not more than $2,750,000,000 is carried as a total at any one time. In our mind that total, hugh as it may seem, is not an alarming mortgage on the total income of the nation which is more than 60,000 millions of dollars.

As time goes on and our living standards increase, we meet with increasing difficulty in defining luxuries from necessities. Ascetics could doubtless indicate several things commonly regarded as necessities that might well be done without, but since asceticism is by no means an American trait, such indication would receive very minor attention. A luxury is that which one could dispense with as being something one could not afford. If installment buying really stimulates the purchase of articles of this sort, or needlessly imposes the onslaving burden of debt, then it is open to criticism. Doubtless it does just this with a certain percentage of the people who take unwise advantage of the deferred payment plan. Knowing, however, that the total installment indebtedness has never exceeded, at any one time, per cent of our annual income, we find it difficult to view the deferred payment tendency as a "cancer eating at the vitals of American business."

Portland Cement Association Elects G. S. Brown President

The annual meeting of the Portland Cement Association was held at the Drake Hotel in Chicago on November 15, 16 and 17. G. S. Brown, president of the Alpha Portland Cement Company was elected president of the Association. E. M. Young, Lehigh Portland Cement Company and Robert B. Henderson, Pacific Portland Cement Company were elected vice presidents. J. W. Boardman of the Huron Portland Cement Company was elected treasurer.

MATERIAL HANDLING METHODS IMPROVED BY BUFFALO ROCK SILICA COMPANY

By E. D. Roberts

REVOLUTIONARY methods for processing any standard material for the market are seldom seen, but Mr. Carl M. Gottfried, president of the Buffalo Rock Silica Company has introduced a new method for preparing silica moulding sand. A few years ago improved methods for handling moulding sand, which was introduced in the Ottawa district, created intense competition in this industry. These methods consisted of handling the sand rock from the deposit face to the car through scalping screens, roll crushers and vibrating screens. After the sand had passed through these operations it was transported direct into the car by a conveyor belt. By this the sand was carried from the deposit to car ready for shipment without being placed in storage during the transit.

When moulding sand was obtained by this method very few men were required to operate the machinery necessary to prepare the sand rock and, as a consequence, the producers were able to place the sand on the car at a very low figure. At this time Mr. Gottfried was convinced that the sand rock could be put in the car with less expense and machinery than was even possible by this improved method. With this in mind, he purchased 130 acres of land covering the west end and extending along the south side of Buffalo Rock, a well known landmark about 3 miles west of Ottawa, and organized the Buffalo Rock Silica Company in order to carry out these plans.

Buffalo Rock has a historical significance as well as being noted for the clean pure silica sand of which it is composed. It was here that the former owners of this territory, the Indians, used to obtain their main supply of meat. Vast herds of buffalo used to roam the level lands adjacent to the Illinois River. Here the Indians would round up a herd of buffalo and drive them up the slope of this rock, which slopes upward to the south and the Illinois River, to the point where the rock ended abruptly

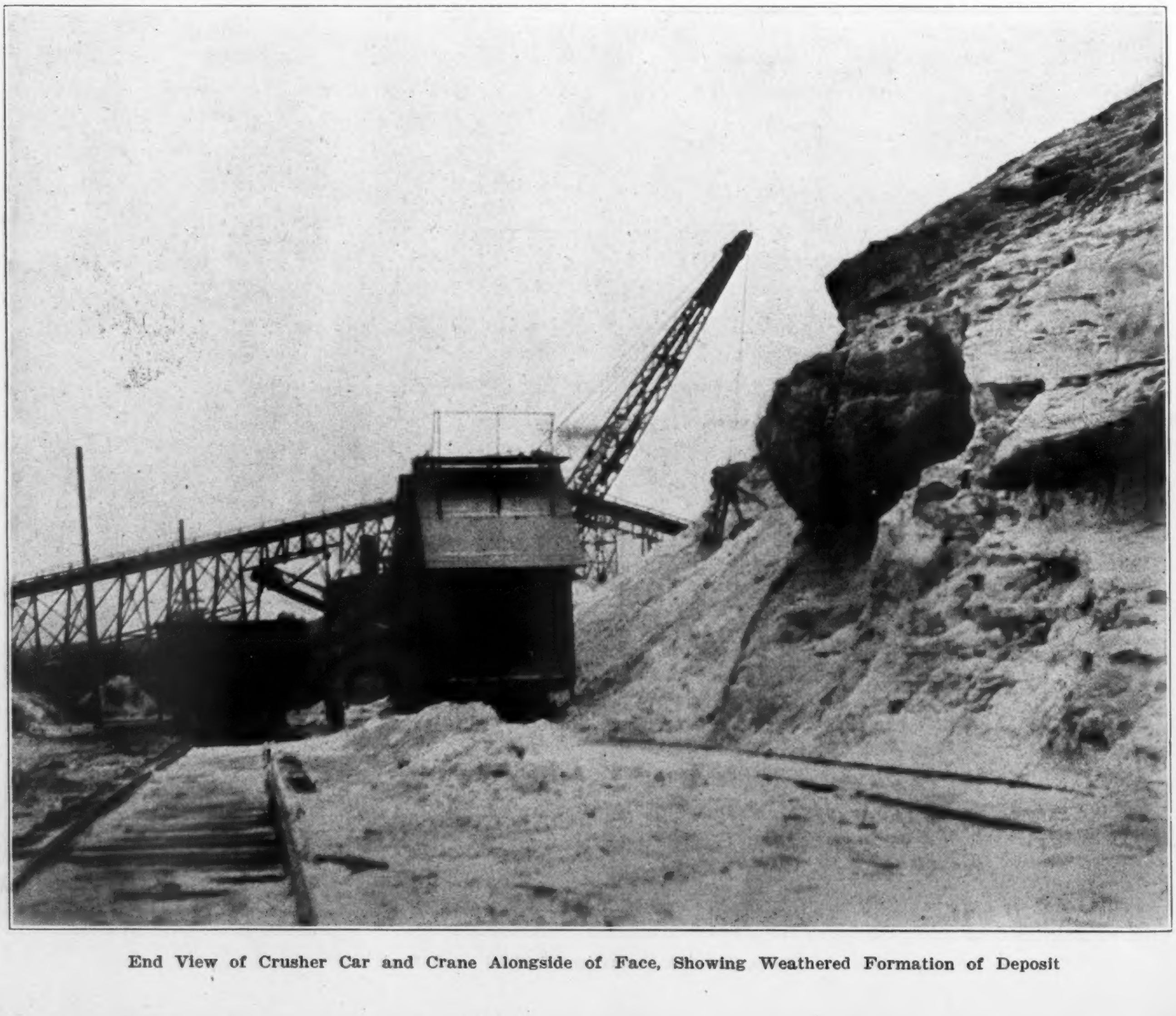
View Showing Formation of Silica Sand Rock in cliffs descending directly into the river. At this point the buffalos were crowded over the cliffs into the river below from which the Indians gathered the carcasses for use as a meat supply. It was this practice of the Indians which gave this rock the name "Buffalo Rock."

Buffalo Rock itself, is part of a deposit of St. Peter's sandstone which has been thrust upward by some convulsive action of the earth in past ages. This sandstone block extends westward a few miles from Ottawa, Illinois, to what is called Split Rock. Here there is a marked change in the rock formation showing that faulting has taken place which has raised this block of sandstone from the great depths at which it is usually found throughout the central states.

St. Peter's sandstone was formed by the compacting of wave-worn washed clean silica sand by superimposed masses of earth and debris. This enormous weight caused the particles of sand to combine into what appears to be solid stone. The sand is nearly pure silica and there is an absence of foreign material to form a binder between the sand particles, the rock showing over 99 per cent silica by chemical analysis, that when it is properly shaken or jarred the sandstone falls to pieces and returns to its original form of sand. Of course there are many lumps that do not disintegrate under the action of a blast and it is to reduce these lumps that crushers and screens have been installed in the several plants which produce screened silica moulding sand.

The tract of land owned by the Buffalo Rock Silica Company extends for over two thousand feet from the west end of Buffalo Rock eastward along the southern precipitous side of the Rock. However, the rock at this point does not descend directly into the river, due to the formation of a gravel bar in the river channel. Throughout this two thousand feet the rock rises abruptly for about 60 feet above this gravel bar. After this first abrupt rise, there is a further rise of fifteen feet of sand rock overtopped by an additional 10 feet of clay.

The upper part of the sand rock is yellow in color due to the percolation, through the rock, of water bearing a trace of iron received from the superimposed clay. Below the yellow rock, is found a pure white sand rock. By carefully removing the clay overburden a pure bulk of silica is obtained which can be handled by machinery in mass production at a low cost and at the same time a pure product is obtained.



End View of Crusher Car and Crane Alongside of Face, Showing Weathered Formation of Deposit

A Marion steam shovel is used to excavate the overlying clay, loads it in dump trucks and haul and dump it on the sand bar. After the shovel has removed this overburden, men sweep the rock perfectly clean with brooms. Hardsocg wonder drills, using air from a Gardner air compressor fitted to a McCormick-Deering 10-20 tractor, place horizontal and perpendicular holes in the sand rock into which Trojan dynamite is placed. Electric detonators are used to explode the dynamite in these holes. Up to this point, the process is exactly the same as that used by the other, older operators in this field. But this company instead of excavating the pulverized sand rock with steam shovels or drag line scrapers, transporting the material by conveyors to the screens and crushers and then to cars spotted one at a time alongside the shipping conveyor, uses a Bay City locomotive crane and a movable crusher and screening house operating on a track located along the toe of the blasted rock. The cars to be loaded, are spotted on parallel tracks alongside the quarry face which extends the full length of the deposit. When loading a train of cars, spotted on the loading track, the locomotive crane starts at one end loading each car in turn. The sand is excavated from the bank by the crane and dropped into a hopper placed in the top of the movable crushing and screening plant. The finished product is then discharged into the car by means of a conveyor belt. By this arrangement it is possible to load in the neighborhood of 80 cars in 9 hours.

Mr. Carl M. Gottfried, President, in Foreground, with Peter Van Tright, Plant Superintendent, at Right

The crushing and screening plant, which is mounted on a standard steel frame flat car, was built to the designs of Mr. Gottfried and his plant

Close up of Portable Screening and Crushing Car superintendent, Mr. Peter Van Tright. In its design a house was constructed, over the car, with roof sloping from the proper clearance height at each end of the car, to the edge of the receiving hopper placed in the center of the car. A platform was provided alongside of the hopper, on which a man can stand and break any large lumps with a maul, so that they will fall through grizzly bars placed over the top of the hopper. A crusher of their own design has been placed directly under the receiving hopper. Below the crusher a vibrating screen shunts the remaining lumps into a Link-Belt roll. This is placed so that the belt conveyor, which receives the sand passing through the vibrating screen, also receives the material passing through the Link-Belt rolls, transports it through the side of the house and discharges into a car spotted on the track. A 75 h.p. Waukesha motor furnishes the power for operating all the machinery in this movable screening and crushing plant.

As soon as one cut has been made along the face, the company will be in a position to furnish the pure white silica sand. This will be accomplished by working the deposit in benches, the crane digging in the lower or upper bench according to the grade of material desired by the customer.

Only 7 men are required to operate the plant exclusive of the stripping operations. This number includes the men placing the drill holes and blasting the sand rock. A remarkably small number when the quantity of output is considered.

Shipments are made over the Chesapeake-Ohio and Pennsylvania railroads and an electric road which acts as a feeder to Chicago Rock Island and Pacific Railroad and the Chicago, Burlington and Quincy Railroad at Ottawa, Illinois, gives the company access to Illinois, Iowa, Michigan, Ohio and Wisconsin markets. Some cars have been shipped to points as far distant as California.

The company will also soon be in a position to make shipments by water due to the construction of Starved Rock Dam which will carry water to the sand bar through an excavation now being made by the Consumers Company. This water transportation will place the company in a favorable position to enter many new markets.

Mr. Carl M. Gottfried is owner and president of the company and maintains an office in the Fischer Building in Chicago and Mr. Peter Van Tright is manager of the plant operations.

Bikle and Brosseau Will Address Crushed Stone Banquet

Henry Wolfe Bikle, general attorney, Pennsylvania Railroad, and A. J. Brosseau, president, Mack Trucks, Inc., will both address the banquet at the convention of the National Crushed Stone Association at Detroit on January 19. There will also be two other speakers at the banquet.

The coming convention of the National Crushed Stone Association is the tenth. The program has not been completed at this date but several engineers of national reputation are expected to take part. The activity of the association during this year indicates that the coming convention will be the largest in attendance ever held.

View Showing Crane and Portable Car Which Carries the Screening and Crushing Apparatus and Discharges the Moulding Sand into Car Alongside

PIT AND QUARRY FOREIGN DIGEST

Washing Sand and Gravel

A rotary washing apparatus for sand, gravel, etc., comprises a series of axially aligned barrel sections, constituting successive washing chambers, which individually are of conical formation, their larger ends pointing to the delivery end of the barrel. The sand is passed through successive chambers by the action of the rotation, vanes lifting the sand from the water and dropping it onto a chute in the center leading to the next chamber. The water passes in the opposite direction. (English Patent 257,715.)

Sawing Stone

The raising and lowering mechanism of a stone-cutting sawing-machine includes an electromagnet applied to an operating or controlling member to cause the automatic raising of the frame from the work in case of a stoppage of the motive power. (English Patent 257,147.)

Molding Concrete Blocks

Tamping machines are constructed to ensure blocks of uniform size, the tampers acting through an intervening member which is adapted to penetrate the mould to a definite extent. The mould may be subdivided by partitions and furnished with cores. (English Patent 257,343.)

Artificial Stone

An abrasive or other aggregate excluding slate is mixed with portland cement and calcium hydrate, and the mixture is subjected to the action of carbon dioxide. The amount of lime is generally 10-30 per cent of the portland cement. The materials may be mixed dry, sufficient water being added for moulding, and the article placed in water until the initial set takes place, or a mortar may be poured into a mould and allowed to set. After the initial set, the articles are exposed to carbon dioxide, which may be under pressure, for example 30 pounds per square inch. The alternate water and gas treatment is repeated until the desired hardness is obtained. (English Patent 257,329.)

Fused Aluminous Cement

A mixture of raw materials is sintered in a refractory-lined rotary tube furnace and the sintered mass fused on leaving the furnace. For this purpose the metal wall of the furnace in the region of the outlet is enlarged in the form of a disc and connected with one pole of a source of current of low tension and high current strength. The disc is set obliquely and can be adjusted by means of a hinge and spring with respect to a metal or graphite plate which is connected with the other pole as a source of current. The sintered mass falls between the disc and the plate, closing the current circuit and being melted by the current flow. (French Patent 604,916.)

The four calcium aluminates, $3CaO.Al_2O_3$, $5CaO.3Al_2O_3$, $CaO.Al_2O_3$, $3CaO.5Al_2O_3$ and the calcium aluminum silicate, gelenite, were prepared in the oxy-acetylene flame, quickly cooled, and thin slides compared by microphotographs with three typical cement-melts.

The setting of fused aluminous cements is described as follows: Addition of water causes aluminum hydrate and small amounts of calcium hydrate to dissolve. After a few days a gel begins to separate consisting mainly of aluminum hydrate. Further hydrolysis causes super-saturation of the solution. The result is that colloidal $Al(OH)_3$ and some $Si(OH)_4$, separate and the cake sets to a solid mass. After this procedure, a different reaction apparently takes place, with watery gels of $Al(OH)_3$, $Si(OH)_4$ and $Ca(OH)_2$ forming tricalcium hydro-aluminate, which crystallizes out in the alumina gel to form a solid felt of crystals and cause a good hardening to take place. (Berl and Loblein, Zement, Vol. 15, p. 759 to 762, 1926.)

Blast Furnace Cement

The results of the ten year tests on the tensile strength, crushing strength, and variation in length of mortar and concrete made with blast-furnace cement fully bear out the results obtained for the shorter periods, and compare very favorably with those given by Portland cement and iron Portland cement. (Zentr. Bauvervalt, 1926, 241.)

Standard Consistence Formula for Cement Mortar Pastes

There is an optimum percentage of water for any definite cement-sand ratio. A decrease from optimum causes greater loss of strength than an increase. Briquettes made with neat cement are not as strong as those containing a limited quantity of sand, perhaps because initial stresses set up during setting and hardening of neat cement briquettes are very severe and are relieved somewhat by the presence of sand which prevents excessive distortion. Sand in greater ratio than 1:1 causes decrease in strength. Total quantity of water required for a mix is:

$$W = \frac{C}{C+S} P + \frac{S}{C-S} K$$

Where $C =$ parts of cement by weight, $S =$ parts of sand by weight, $P =$ parts by weight of water required for preparation of neat cement briquettes, and $K =$ parts of water by weight required to wet the sand. (Concrete and Constructional Engineering, Vol. 21, 1926, p. 682-691.)

Mortar Strength of High Quality and Ordinary Portland Cement

The cost of high quality Portland is ¼ higher (in Germany) than that of ordinary cement, but so far as resulting strength is concerned 1¼ parts by weight of ordinary cement are equivalent to 1 part high quality Portland. The loss by dusting and cost of transportation are necessarily lower with the latter, the ratio being 4:5, and the high quality cement is therefore, preferable from an economic viewpoint. The results of detailed investigation showed that in all mixing ratios, and with various additions of water, 0.8 parts by weight high quality Portland gave the same results as 1.0 part by weight of ordinary Portland cement. (Dr. Haegermann, Zement, Vol. 15, p. 757-759, 1926.)

Color Changes in the Burning of Portland Cement

The compounds of iron in Portland cement may be converted during sintering to the metal by reducing agents. Yellow, brown and red colors of the clinker are not removed on reduction. Ferric oxide is free immediately after the sintering process. However, on slow cooling the ferrous oxide is converted to ferrites. When this is not done, the ferrous oxide colors the material. (Zement 1926, 15, 456-458.)

Preparation of Cement-like Masses

Natural or artificial gypsum including the dihydrate is mixed or ground with acid salts of the alkali metals or of the alkaline earths with, or without the addition of free acid. A gypsum mortar of great tenacity is obtained, for example, if natural gypsum is finely ground with 0.2-0.5 per cent $NaHSO_4$ or $KHSO_4$. (D. R. P. 432, 542.)

Sulphur Hardened Concrete

At 130-150 degrees C. sulphur is very fluid, whereas at higher temperatures it is more viscous. When concrete is impregnated with sulphur at the above temperatures, the moisture content of 10-25 per cent is first removed. A film of solid sulphur forms first on the surface, this melts again as the concrete reaches the temperature of the bath. When the moisture has been removed the penetration of the concrete begins. The distance of penetration depends upon the degree of porosity. With commercial, well dried material, the penetration reaches 5 centimeters in 8 hours. The sulphur impregnated concrete has an increased strength. Ordinary test pieces which had a tensile strength of 10 kilograms per sq. cm. had a tensile strength of 120 and 140 kg. per sq. cm. after impregnation. A concrete made of aluminous cement in ratio of 1:5 exhibited after impregnation, a crushing strength of almost 1,000 kg. per sq. cm. Certain azo dye stuffs are soluble in sulphur and can be used to color concrete with the aid of this material. (Wernekke, Zement, Vol. 15, p. 771-2, 1926.)

Progress in Cement Manufacture

Many interesting mechanical and chemical developments have contributed to the progress of the cement industry since it began its rapid growth 30 years ago, states the Bureau of Mines, Department of Commerce. The first kilns were vertical, like lime kilns, and operations were intermittent. An attempt was made to improve operation by making it continuous, but as this change could at most only double the output, interest was soon directed toward the rotary kiln which was in use in England. This type of kiln was first introduced into the United States in 1889. Its use necessitated radical change in the form of fuel, for the vertical kiln had used coke or coal interbedded with the stone, but the rotary required a gaseous fuel and this could be supplied only by blowing oil, gas, or pulverized coal in the kiln. This change of kilns and fuel, which became general within the next few years, marks the beginning of the rapid increase in output of Portland cement through increased capacity of plants and lower cost of production.

Other important developments in the industry were the introduction of steam shovels in quarrying, enlargment of crushing, grinding, conveying, and storage facilities, improvements in power plants, introduction of electrical drives, use of mechanical packing and weighing devices, improvement and extension of wet process, finer grinding of raw materials and finished cement, dust collection, increased length and diameter of kilns, enlargement of lower end of kilns, utilization in power plant boilers of waste heat from rotary kilns, and the use of concrete for plant construction.

A recent trend in the industry has been toward still further improvements in Portland cement and the development of special qualities, such as the early hardening of the high-alumina cements which makes them desirable for road or bridge repair work in cold weather or where the forms can not long be used. Quick-setting cement has been developed for use in oil wells and cement with good plasticity and water-retarding properties for use in stucco finish. To some extent the efforts to produce improved Portland cement have led experimenters outside the limits of that type of cement officially defined as "the product obtained by finely pulverizing clinker produced by calcining to incipient fusion an intimate and properly proportioned mixture of argillaceous and calcareous materials with no addition subsequent to calcination except water and calcined or uncalcined gypsum." Certain of the departures are fused cements high in iron and alumina or in titanium.

UNIFORM MECHANICS LIEN ACT DRAFTED FOR ALL STATE LEGISLATURES

FOR several years there has been discontent with the mechanics' lien legislation in a number of states, and with the great lack of uniformity among the acts of the forty-eight states and other territorial jurisdictions of the nation. Many leading men connected with the construction industries, and owners of buildings believed that a thorough consideration of lien law provisions should be made by an impartially constituted body. The National Association of Builders' Exchanges formally asked for the co-operation of the Department of Commerce, and several other national organizations endorsed the proposal. Secretary Hoover accordingly appointed a committee which would undertake to draft an act, and arranged for the Department to provide it with a secretary and facilities for meetings.

This committee therefore submitted a first tentative draft, and a desire of having the same subjected to the processes of the Conference to the end that a Uniform Mechanics' Lien Act may be adopted by the Conference and recommended to the several states for enactment.

Mechanics' lien laws as applied to building construction aim to provide a simple procedure by which contractors, building trades workers, those furnishing material, and subcontractors may, if they are not paid promptly, obtain some extra protection beyond their usual right to bring personal action against the owner, contractor or subcontractor who may have employed them.

There are two principal classes of cases in which those furnishing materials, labor or other services for the building may be protected under lien laws. In the first, the owner is solvent, but he fails to pay laborers, subcontractors or material men on time. The second class of cases arises where the owner is unable or fails to carry out his payments to the contractor. There are, of course, cases coming within both classes.

Lien laws customarily provide that those who furnish service or materials for a building and are not paid promptly, may file a lien at a recorder's office. This lien stands as a direct charge, somewhat like a mortgage, against the property benefited by the improvement.

Cases in which contractor defaults—Points usually considered desirable in lien acts with reference to the first class of cases, include the following:

If the contractor fails to pay his bills promptly the owner should know of it at once so that he will not go on making installment payments to the contractor, who may be using them for purposes other than paying off his obligations for the particular piece of work in hand. It is ordinarily implied or expressed in every building contract that the contractor shall protect the owner against liens. If he does not do so, the contract is broken and the contractor's affairs become recognized as a matter of common concern to the owner, as well as the creditors.

Lien laws should be so framed that a solvent owner whose contractor defaults may proceed with construction with the least possible delay and uncertainty, and not be unduly hampered in making a legitimate transfer of the property.

Cases in which the owner defaults—This second class of cases usually arises when the owner becomes insolvent and provision is made for a forced sale of the property in order to satisfy the claims of lienors. A lien law must therefore state under what circumstance a lien will take priority over a mortgage, building loan, or other obligation attaching to the property, and vice versa. It is also desirable that action be as prompt as possible in order that work may go ahead in cases where completion of the building will be advantageous to the equity of lienors and others having an interest in it.

The provisions of State laws relating to the amount of the owner's liability and the extent of protection afforded the lienor may be classified into three general types.

1. Under some lien laws the owner may be held liable for all the unpaid debts of the contractor incurred on the job. Under them an owner might pay a contractor in full on a $10,000 contract and then have to pay liens for an additional $3,000 or $4,000.

2. Under another type of law the owner is liable for no more than the contract price, and in case liens are filed, has merely to see that lien claimants are satisfied up to the amounts due the general contractor. In the case of a $10,000 contract, for example, the owner might pay out $8,000 according to the contract when the work is nine-tenths completed and then be liable to lienors up to the sum of $1,000 at the time, and thereafter for a sum up to $1,000 additional, which they might earn in completing the job.

3. A third type, followed in this draft, is similar to the second type in not holding the owner liable for more than the contract price. But it imposes on him, when making payments to the contractor, the obligation of requiring from the contractor a statement, under oath, showing sums due or to become due to subcontractors, material men and laborers for services already performed on the operation. If the contractor furnishes a false statement he is liable to penalty for perjury, but the owner is protected from a possible double liability. The owner retains money due the contractor up to the amount of his obligations as shown by the con-

tractor's statements, and by notification to the owner by material men or subcontractors of the value of the services they have rendered. This method appears to be practical from the point of view of owners, and at the same time gives persons employed by the contractor substantially greater protection than acts of the second type.

Lien acts contain provisions for priorities as between liens and mortgages. Laborers' liens for personal services on the job are given priority over all other mechanics' liens under practically every act. There is also a wide variety of provisions in certain acts giving priorities among lienors according to the date of commencement or completion of their work, the day, hour and minute of filing the lien, etc. The committee has endeavored in this draft, to place all liens on a parity, so far as possible.

In brief summary, then, it appears that in a lien law the following factors deserve consideration:

1. Protection of interests of the owner.
2. Protection for contractor, architect, and others employed directly by the owner.
3. Protection for material men who furnish materials to owners, contractors or subcontractors for the job.
4. Protection for subcontractors who may furnish service or materials for the contractor.
5. Protection for building trades workers.
6. Protection for owners of mortgages and building loans.
7. Provisions for prosecution of the work after liens are filed.
8. Provisions for additional financing after liens are filed. This draft does not cover the following points: Public Works—Liens in connection with public works almost universally attach only to the funds appropriated for a given enterprise, and not to the property. For this reason and due to the fact that it is a general custom in public works contracts for the governmental authority to require a bond from the contractor covering possible liens, the committee has decided that public work should not be considered.

Liens against railroads—The draft does not apply to such matters as railroad track labor, work on rights-of-way, etc., the committee feeling that liens arising in such work are in a different category from those on ordinary private construction. It does, however, apply to buildings constructed for railways, as in the case of all other private owners.

Mines—In nearly all the states which provide for mechanics' liens on mining property, such provisions constitute separate sections of the statute. Since mining is not carried on in all of the states and is not closely related to ordinary construction, the committee feels that these liens are not within the scope of the study and can best be taken care of separately as at present.

Homestead laws—Provisions of homestead laws of the different states applying to claims arising under liens were also felt to be beyond the scope of the committee.

Court procedure—The draft does not go into procedure any more than is necessary. In foreclosing a lien on property, for example, there are usually mortgages also to be considered and the committee felt that to go into such matters as the details of foreclosure was beyond its scope. The constitution of local courts, methods of appeal, etc., are also so ingrained into the systems of law built up throughout the history of the several states that detailed procedure in other respects could not well be covered with any prospect of securing uniformity. Much of the criticism which has been directed against mechanics' lien laws is in reality an indictment of antiquated court procedure. The committee is wholly in accord with the view that procedure in American courts is in need of a thorough overhauling and revision, to be based on careful and painstaking study by the ablest minds available. The successful reform of court procedure would be of inestimable advantage of expediting just conclusions in lien cases, and the movements in that direction deserve the support of all those who wish lien cases settled smoothly and promptly.

The committee believes strongly that the construction industries and the public interest would be greatly benefited by greater uniformity in state lien laws. To this end it believes that a uniform act should be as simple as possible and be fair to all parties concerned, as indicated in the introductory section. It believes, furthermore, that lien laws should not be such as to promote laxness or irresponsibility in the credit relations in the construction industry. Unless some one group is to assume a disproportionate share of risk, each group must be willing to assume its fair share of risk.

A lien law fit to be made uniform should be simple enough to be readily understood by all parties concerned. The parts of lien laws relating to cases where all parties but one are solvent and aboveboard in their dealings, which comprise the great majority of lien cases, are comparatively simple, but a considerable number of provisions must be inserted to cover the less usual types of cases. The lien law should be explicit, which sometimes involves insertion of detail, and in such form that each group should understand what precautions it should take in order to protect itself and others concerned. Owners, for example, should generally realize the liability which may follow their failure to follow procedure laid down with reference to obtaining statements under oath from contractors. The committee believes that the practice in some cities of builders' exchanges, or other organizations, mailing copies of the lien law to all owners who take out building permits is a step in the right direction. It is suggested that to this end a synopsis of the whole act might be useful.

BUREAU OF MINES ACTIVE DURING 1926

CONTINUATION of the educational campaign designed to decrease the death and injury rates among the million miners of the United States was the predominant feature of the activities of the Federal Bureau of Mines during the fiscal year 1926, Director Scott Turner emphasizes in his annual report to the Secretary of Commerce. Substantial progress was achieved in the movement for the rock-dusting of bituminous coal mines as a preventive of explosions, a great number of the larger mines having adopted this safety measure. A striking instance of the efficacy of rock-dusting was afforded in the explosion in the New Orient coal mine in southern Illinois in January, the employment of rock-dust localizing the explosion and holding the number of deaths to five at a time when approximately 1,000 men were at work in the mine.

The Bureau continued its intensive efforts in the teaching of safety to the miner. During the year 28,041 miners were trained in first-aid and mine rescue methods, an increase of 3,866 over the number trained in the previous year. Since the beginning of this work, the Bureau has instructed nearly 200,000 miners, and has also given safety instruction to many city firemen, policemen, boy scouts, scholars in public schools, and the wives and children of the miners. During the past year this training was conducted in 33 States and in Alaska.

Mine-Safety studies were continued in the experimental coal mine at Bruceton, Pa., the only coal mine in the world devoted exclusively to Government safety research. Tremendous explosions of coal-dust are frequently staged at this mine and vivid demonstrations of the efficiency of rock-dust for limiting or preventing such explosions are given. Cooperation was continued with the Mines Safety Research Board of the British Mines Department at the Bureau's experimental station at Pittsburgh and in the Eskmeals experimental gallery in England. A new type of gas mask, devised to afford protection in air against all gases, vapors and smokes was developed. Studies recently completed by engineers of the Pittsburgh experiment station have demonstrated that voice signals can be transmitted in and out of a mine, through more than 400 feet of strata, by the use of dry cells as a source of electrical energy and of modified telephone parts as receiving and sending apparatus. The development of practical means of communication between miners entombed after mine fires and explosions and rescue parties on the surface would naturally be of the greatest aid in the conduct of mine rescue operations.

A carbon monoxide recorder developed at the Pittsburgh station has given excellent service in a number of fields. This delicate instrument gives warning of the presence of this deadly gas in tunnel atmospheres of four parts in ten thousand parts of air, and indicates much lower concentrations. The recorder should prove of value in the maintenance of safe atmospheric conditions in the vehicular tunnels of the country now congested with automobile traffic. A new method of measuring the rate of detonation or speed of an explosive has been developed by the Bureau, in which a photograph of a detonating column of explosive is taken on a rapidly moving film.

The Bureau's safety campaign has been extended to the legion of workers in the petroleum and natural gas industries, and great interest has been aroused among these employees. First-aid teams, trained to a high degree of efficiency in safety measures, have been organized at numerous points in the oil producing and refining districts.

Actual production of shale oil has begun at the experimental oil-shale plant established near Rulison, Colorado, as the result of special Congressional legislation. American-type and Scottish-type retorts are being operated for purposes of comparison. It is hoped that the operation of this experimental plant may be an important step in the development of an American shale oil industry which at some future date may attain tremendous proportions.

Helium Production Plant No. 1, near Fort Worth, Texas, was transferred during the year from the Navy Department to the jurisdiction of the Bureau of Mines. The Bureau is conducting an intensive search for sources of helium, so vital in the operation of monster dirigibles of the Los Angeles type. A Government helium reserve has been established to include the Woodside, Utah, natural gas structure in which helium gas has been discovered. Through use in airships, helium becomes contaminated by double diffusion, that is, helium escapes through the walls of the gas cells and air enters through them. A helium purification plant designed by the Bureau has been turned over to the War Department. This plant is capable of purifying 5,000 cubic feet of helium per hour, raising the purity from around 85 to about 98 per cent. Experiments in the use of synthetic atmospheres, composed of helium and oxygen, in compressed-air work, conducted by the Bureau of Mines in cooperation with the Navy Department, and the U. S. Public Health Service, have demonstrated the value of these mixtures in increasing the efficiency of divers and decreasing the hazard to their health. If cheap helium can be made available, it is believed that the results of this research should greatly extend the whole range of submarine and compressed-air engineering.

The Bureau continued its study of the causes of mine fires and explosions, furnishing reports to the mine operators following investigations of disasters at their mines. Investigations on the use of electrical equipment in mines and the use of flame safety-lamps and gas-detecting apparatus were continued. The Bureau's "permissible" list now covers virtually every line of activity for which equipment is used in underground coal mining. Manufacturers are giving more attention to the designing of permissible mining machinery, and the Bureau looks forward to the time when operators will be able to equip their mines completely with apparatus that has been tested and listed as permissible.

The Safety Extension Service was established during the year. Its chief functions are to bring before the industry the Bureau's recommendations on rock-dusting bituminous coal mines, the use of closed lights, advanced mine rescue training, mine safety organization, and the purpose of the Holmes Safety Association; also to conduct field demonstrations of the explosibility of coal dust and the use of rock-dust as a preventive of mine explosions. The Joseph A. Holmes Safety Association, named in honor of the first Director of the Bureau of Mines, has among its members thousands of miners who are making special efforts to advance safety in mining. During the year, 30 new chapters were organized—13 in Pennsylvania, 11 in Alabama, 2 in Wyoming, 2 in Kansas, 1 in Missouri, and 1 in Oklahoma.

In many places metal mine workers are seriously menaced by harmful dusts and lack of ventilation. The Bureau is studying ventilation conditions in various metal mines throughout the country.

Chemists at the Pittsburgh experiment station have developed a new respirator which is believed to be superior to other devices as a means of protecting wearers from injurious dusts encountered in mining and other industries. Studies conducted in cooperation with the United States Public Health Service and the American Society of Heating and Ventilating Engineers are affording information relative to temperatures and air-movement conditions which afford the best safety and efficiency conditions in mines and factories. Sanitary surveys of mining towns in various parts of the country have been made by Public Health Service officials attached to the staff of the Bureau of Mines. A study of the serious problem of pollution of streams by waste waters from mines is being conducted. Health hazards in the use of ethyl gasoline were investigated.

As the result of studies by Bureau engineers, definite increases in the production of lump coal in mines have been attained through more efficient use of explosives. The use of liquid oxygen explosives in the mining and quarrying industries has been investigated.

Studies have been conducted looking toward the utilization of vast deposits of low-grade iron ores in Minnesota, Alabama and elsewhere. As an aid to this study, the Bureau operated at its Minneapolis station the only experimental blast furnace in the world capable of producing conditions encountered in the large commercial furnaces. Studies designed to liberate the United States from dependence on imported high-grade manganese ores and manganese alloys, essential in steel making, are in progress. It is estimated that in the Rocky Mountain district alone the grinding of ores wears away more than 200,000 pounds of mill balls daily. The Bureau is endeavoring to develop mill-ball material that may greatly minimize these losses. Improved metallurgical practices designed to utilize enormous deposits of low-grade lead, zinc and copper ores are being developed at the Bureau's different experiment stations located in the mining districts of the West. The application of oxygen or oxygenated air to metallurgical fields and problems is being studied. Development of such processes, depending on methods for the cheap production of oxygen, would effect considerable savings in many metallurgical processes.

At its New Brunswick, N. J., experiment station, the Bureau is studying methods for the utilization of small limestone fragments now wasted at lime plants. In view of the wide use of mica in radio and electrical equipment, better methods for the mining and preparation of this material are being investigated.

During the year a survey was made in several States of leakage in natural gas transmission lines, and immense savings were found possible by testing and repairing the lines. In the Powell oil field in Texas, an increased production of 1,000,000 barrels of oil was attained from wells repaired under the supervision of Bureau engineers. The Bureau is studying the problem of increasing the recovery of oil from depleted sands, it being estimated that 80 per cent of the oil is left underground under present methods of production.

The Bureau continued its studies looking toward the more efficient utilization of fuels in industrial plants and in homes. Problems of this nature studied included refractories in boiler furnaces; the clinkering properties of coal; pulverized coal for marine boilers; properties of coke; coal washing; boiler water conditioning; and the spontaneous combustion of coal. Studies are being undertaken looking toward the catalytic conversion of coal, through water gas, to methanol and other organic compounds and mixtures suitable for motor fuels and other public needs.

With the transfer of the Bureau to the Department of Commerce, an Economics Branch was established for the study of economic problems in the mineral industries. This new branch is given attention to the uses of coal, coal reserves, prices, distribution, consumption, stocks and marketing. A statistical analysis of strikes and lock-outs in the coal-mining industry during the past 75 years has been made.

HIGHWAY RESEARCH PROGRAM

The announcement of the advance program for the Sixth Annual Meeting of the Highway Research Board of the National Research Council to be held at Washington, D. C., is of interest. The many important features listed will assure a gathering of highway research workers, engineers, officials and representatives of the highway and automotive industries such as to make the Sixth Annual Meeting the most successful one in the history of this organization.

In addition to the reports of the research committees of the Board, each of which will be discussed by authorities in their respective fields, there will be received progress reports on the special investigations, conducted under the auspices of the Board, on culvert structures and on low cost improved roads.

Other features of interest will be an address by Dr. Geo. K. Burgess, director of the U. S. Bureau of Standards, a report by Dr. H. C. Dickinson, a member of the Executive Committee of the Highway Research Board, on the decision of the Board to appoint a Special Committee on Causes and Prevention of Highway Accidents; an address by Mr. T. H. MacDonald, Chief of the U. S. Bureau of Public Roads; and a paper by Dr. Charles Terzaghi, of the Massachusetts Institute of Technology on the Methods and Possibilities of Road Soil Investigations. The meeting will be open to all persons engaged or interested in any branch of highway engineering.

Following is the advance program:

Thursday, December 2
Morning Session, 10:00 A. M.

Presiding officer..................A. N. Johnson
University of Maryland

Address of Welcome............Vernon Kellogg
National Research Council

Address......................Geo. K. Burgess
U. S. Bureau of Standards

Report of Director...............C. M. Upham
Highway Research Board

Report on Formation of Special Committee on Causes and Prevention of Highway Accidents.........................H. C. Dickinson
Highway Research Board

General Discussion:

Afternoon Session, 2:00 P. M.

Presiding Officer...................W. K. Hatt
Purdue University

Address.....................T. H. MacDonald
U. S. Bureau of Public Roads

Report of Committee on Economic Theory of Highway Improvement......T. R. Agg, Chrmn.
Iowa State College

Includes studies by Messrs. Agg, Conrad and Waller.

Special Report by.................H. B. Shaw
North Carolina State College

General Discussion, opened by.............
....W. L. Holt & P. L. Wormeley
U. S. Bureau of Standards

Report of Committee on Structural Design of Roads................A. T. Goldbeck, Chrmn.
National Crushed Stone Assn.

Includes studies by Messrs. Benklemann, Buchanan, Burton, Connell, Connor, Eno, Hatt, Henderson, Hogentogler, Mullis, Pauls, Strahan, Teller, and Westergaard.

General Discussion, opened by........H. E. Brood
New York University

Report of Committee on Character and Use of Road Materials.......H. S. Mattimore, Chrmn.
Pennsylvania State Highway Dept.

Includes studies by Messrs. Anderson, Crump, Lang, Mattimore, Reeve, Scofield and Withey.

General Discussion:

Concrete Materials, opened by......D. A. Abrams
Portland Cement Association

Bituminous Materials, opened by Prevost Hubbard
The Asphalt Association

HIGHWAY RESEARCH DINNER, 7 P. M.
Hotel Washington

Friday, December 3
Morning Session, 10:00 A. M.

Presiding Officer..............T. H. MacDonald
U. S. Bureau of Public Roads

Report of Committee on Highway Traffic Analysis................G. E. Hamlin, Chrmn.
Connecticut State Highway Commission

Composite report by Committee Members:

General Discussion, opened by......F. E. Everett
New Hampshire State Highway Department

Report of Committee on Highway Finance....
..................H. R. Trumbower, Chrmn.
University of Wisconsin

Consists of study by Chariman:

General Discussion, opened by......J. N. Mackall
Maryland State Roads Commission

Afternoon Session, 2:00 P. M.

Presiding Officer................A. J. Brosseau
Mack Trucks, Inc.

Progress Report on Culvert Investigation....
..............................R. W. Crum
Iowa State Highway Commission

General Discussion, opened by......G. M. Braune
University of North Carolina

Progress Report on Low Cost Improved Road Investigation..................C. N. Conner
Highway Research Board

General Discussion, opened by....C. H. Moorefield
South Carolina State Highway Commission

Paper on "The Methods and Possibilities of Road Soil Investigations"......Chas. Torzaghi
Massachusetts Institute of Technology

Crushed Stone Association Officials In Midst of Transcontinental Trip

The transcontinental trip of the officers of the National Crushed Stone Association for the purpose of establishing personal contact with the producers of several states is now in progress. The first meeting was held at Madison, Wisconsin, in the Loraine Hotel on November 8th. This was a luncheon meeting and started at one o'clock.

There were forty-five present, representing crushed stone producers from Illinois, Iowa and Wisconsin. The highway staff of the University of Wisconsin, and the Wisconsin Highway Commission were also represented. Several city officials of Madison were present. Mr. A. J. Blair, of the Lake Shore Stone Company was chairman and arranged the meeting. Mr. Blair opened the meeting and discussed briefly the early history of the National Crushed Stone Association and then introduced President Otho M. Graves. Mr. Graves gave a very interesting talk on the accomplishments and plans for future extension of the work of the association. A. T. Goldbeck, director, bureau of engineering of the National Crushed Stone Association explained the work of his department. Regional vice president, W. R. Sanborn of Kankakee, Illinois, and Secretary Boyd, Mr. Shearer of Milwaukee, Wisconsin, and Mr. Ross of Dubuque, Iowa, made brief talks.

The second meeting was held on Tuesday, November 9th at the Minnesota Club at St. Paul. John Wunder, John Wunder Company, was chairman and arranged this meeting which was a luncheon affair. The attendance was satisfactory and the officers of the National Crushed Stone Association were pleased with the interest shown.

The third meeting was held at the Fontenelle Hotel, Omaha, Nebraska, at nine o'clock November 10th. Thomas Sullivan was chairman and arranged the meeting. J. F. Schroeder, a member of the board of directors of the National Crushed Stone Association was present at the meeting. There was a large attendance of crushed stone producers from Nebraska, Iowa and Missouri. Several local engineers were also present. Considerable time was given over to a discussion of the quarry problems of those present. A luncheon was held and the entire attendance remained. President Graves gave his interesting talk on the Association. W. R. Sanborn and J. F. Schroeder discussed the crushed stone industry in general. A. T. Goldbeck interested those present with a talk on the technical problems of the crushed stone industry. Secretary Boyd made a strong plea of new memberships. The meeting was adjourned at 4 o'clock and the touring party made preparations to leave for Cheyenne, Wyoming, where a meeting was held on Nevember 11th at the Chamber of Commerce.

Successive meetings of a similar nature were at Denver, Colorado, on November 11th, with James Lawrence, Chairman; at Salt Lake City on November 13th with Eric Ryberg as Chairman; at Portland, Oregon, with Daniel Kern, Chairman and San Francisco, on Monday, November 22nd with A. R. Wilson, chairman.

Meetings have also been planned for Los Angeles on November 24th with G. A. Rogers, chairman, at El Paso, Texas, on November 29th, at the Hotel Orndoff with A. Courchene as chairman; at San Antonio, Texas, at the Hotel Gunter with R. J. Hank, chairman, on November 30th; at New Orleans, Louisiana, at Hotel St. Charles on December 2nd with I. L. Lyons chairman; at Atlanta, Georgia, on December 3rd with Thomas McCroskey, chairman; and at Nashville, Tennessee on Saturday, December 4th, with A. B. Rodes, chairman.

Bauxite in United States

The bauxite deposits of the United States are in central Arkansas, northeastern and southeastern Alabama, northwestern and west-central Georgia, northeastern Mississippi, and eastern Tennessee, states the Bureau of Mines in a recently issued report. The bauxite from all localities in the United States, though it may vary in chemical composition, is on the whole similar in general appearance, with the exception of the "granitic bauxite" of the Arkansas field. The greater part of the American bauxite appears to be made up of rounded pebblelike bodies set in a fine-grained matrix, which may also consist of small rounded particles or may be as fine grained as the finest clay. The pebble or pisolite form is so general that it is the conspicuous characteristic of American bauxite.

There is only one way to determine the value of bauxite, and that is by chemical analysis, which should show total silica, alumina, titanium oxide, iron oxide, and water. Bauxites of commercial grade should carry at least 52 per cent of alumina. Some measure of the relative quality of dried bauxite can be had by grinding a sample in an agate mortar for half a minute.

Annual Meeting of W. M. A. A.

The Annual Meeting of the Wisconsin Mineral Aggregate Association will be held in Milwaukee, on Thursday, December 16, and will comprise three sessions as follows: The annual election of officers and the transaction of association business will take place in the morning. (Open to members only.) A meeting will be held in the afternoon, open to all producers and those of allied interests, with a program comprising discussion of subjects of interest to producers of sand, gravel and crushed stone. In the evening, there will be a dinner and entertainment.

Macleod-Keeney Exhaust Fans

The Macleod Company has recently issued a circular describing the Macleod-Keeney everlasting exhaust fans which this company manufactures. The principle of these fans is to have a projected inlet adjacent to the discharge outlet and is radically different from the usual design as fans are usually designed with a center inlet. Therefore with the Macleod-Keeney fans the material is discharged without passing through the wheel or around the housing, with the result that the housing and wheel do not wear out and this principle has created for these fans the term "everlasting." In practice the air is forced centrifugally to the side of the housing, opposite the wheel, and the pressure of the air passing the projected inlet creates a high suction. Pressure up to 12 inches (6.92 ounces), is obtainable and these fans producing this strong suction convey the material, as desired, without requiring much horse power to operate them.

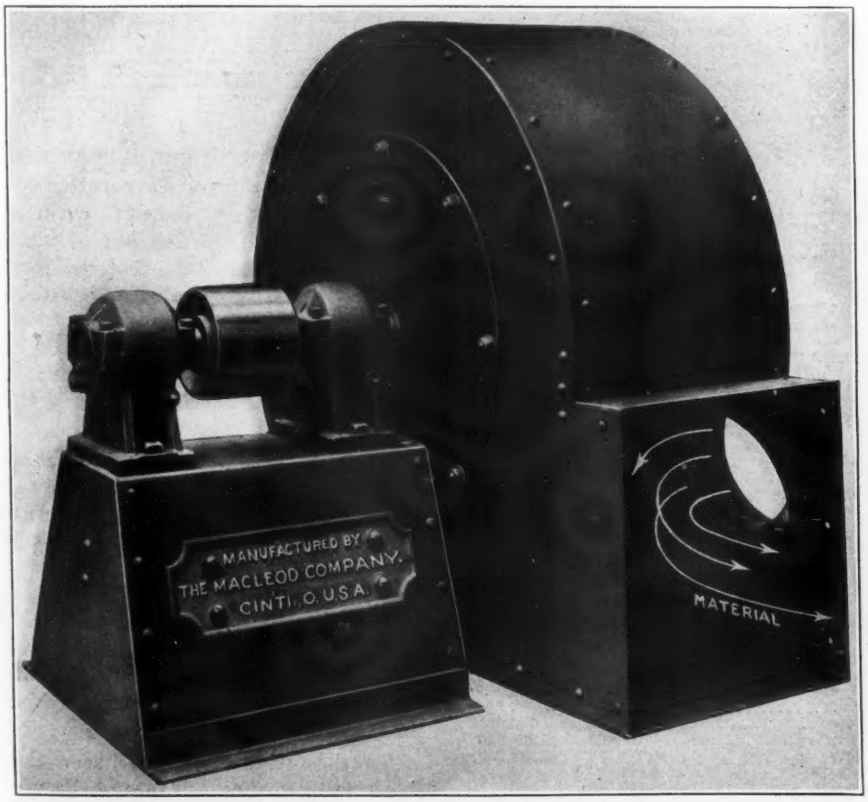
The fans are designed to be adjustable to a marked degree. Each machine is adjustable to over thirty different combinations. They may be placed on the floor or suitable foundations or reversed and bolted direct to overhead timbers, thus saving the cost of building a platform. The discharge outlet may be adjusted to points in any desired direction at will. Upright or suspended machines may be changed and adjusted equally as convenient.

These fans are built almost entirely of steel, including the housing, bearing standard and wheel. The material used in this construction is blue annealed Armco rust resisting ingot iron sheets.

The shaft revolves in ball bearings of generous dimensions which are of the double row and self aligning, spherical-surface type. The bearing housings are extra large, the upper half being removable and provided with felt washers to retain the oil. These bearings only require a small amount of lubricant about once in three months. When desired babbitted bearings of the double ring oiling type will be supplied instead of the standard ball bearings.

The wheels are constructed with radial wings and built entirely of steel, with the exception of the hub. These wheels are carefully made, accurately balanced and tested to insure the removal of tangential strains which would be set up by an unbalanced revolving wheel.

The circular contains a list of the various sizes of fans manufactured giving the company's catalog number for each fan. The data given covering design of each fan are: diameter of inlet; diameter of pulley and face width; approximate weight, single; approximate weight, double; prices and capacities for each fan under various conditions.



Macleod Keeney Exhaust Fan

New Incorporations

Thunder Bay Limestone Co., 2214 First National Bank Bldg., Detroit, Mich. $50,000. Pres., Fred J. Kennedy; V. P., Edith P. Cummin; Sec., Bruce G. Booth; Treas., Edith P. Booth.

Liberty Marble & Granite Co., Spartanburg, S. C. $10,000. Pres., Smith Wood; V. P.-Treas., J. R. Jordan, 146 S. Liberty St.; Sec., Helen W. Jordan.

Platte River Sand & Gravel Co., Omaha, Nebr. $250,000. John A. Kuhn, Wm. J. Hynes, Frank B. Johnson, H. J. Albers, Joseph P. O'Keefe. Operations will be carried on in Nebraska and western Iowa.

Ralph Sand & Gravel Co. $10,000. L. Di Fonzo, Pres., G. A. Ostergren. Filed by C. A. Kahn, 215 Montage St., Brooklyn, N. Y.

Georgia Portland Cement Corp., Augusta, Ga. J. Lee Hankinson, Pres.; John C. Hagler, V. P.; D. M. Lyon, V. P.; H. T. Neill, Treas.; J. C. McAuliffe, Sec. $3,000,000. To build plant near Sandersville, Ga.

G. F. Boyce, Cherry Valley, N. Y. $40,000. Stone. G. F. and M. C. Boyce, John M. Burton. (Filed by W. H. Maider, Gloversville, N. Y.)

Supreme Cement & Concrete Co., Kings County (P. O., Brooklyn), New York. $10,000. S. Hechtor, M. Rubin, H. Davis. (Filed by A. M. Hillman, 38 Park Row, Manhattan, N. Y.)

Glenn-Rock Concrete Products, Inc., Jamesburg, N. Y. $50,000. R. Glenn Davidson, Samuel L. Good, Sr., Samuel L. Good, Jr., Jamesburg, N. J. Attorney, John P. Kirkpatrick, New Brunswick, N. J.

Woodland Sand & Gravel Co., Newton, Mass. $50,000. Stone, rock, gravel, etc. Amato and Filomena Pescosolido, Gataldo and Carmelt Marchioni.

Victoria Sand & Gravel Co., Victoria, Tex. $22,000. F. S. Buhler, W. B. Dupre, J. L. Dupre.

West End Sand Co., Louisville, Ky. $15,000. C. Berger, Dora Berger, F. J. Keenan.

Diamond Crushed Stone Corp., Asheville, N. C. To quarry rock and stone and deal in building material. Authorized capital, $150,000 subscribed $50,000 by Dawson Wylly and Virginia Wylly of Biltmore, and Helen Marsak of New York City.

R. C. Belk Sand Co., Mount Holly, N. C. To excavate sand and gravel. Authorized capital, $16,000; subscribed $16,000 by R. C. Belk, Mount Holly; H. J. Dunavant, Charlotte; and L. C. Gunter, Knoxville, Tenn.

Wolf Creek Sand & Gravel Co., St. Louis, Mo. $15,000. J. E. Schwarz, 4523 Gibson St.

DISTRIBUTION OF CEMENT

Portland cement shipped from mills into States, in August and September, 1925 and 1926, in barrels*

Shipped to—	August 1925	August 1926	September 1925	September 1926
Alabama	277,605	173,619	192,882	153,636
Alaska	264	1,130	455	668
Arizona	33,328	45,553	34,380	42,709
Arkansas	88,143	71,312	54,377	75,962
California	1,154,523	1,165,387	1,120,092	1,204,615
Colorado	118,335	133,172	122,128	137,054
Connecticut	194,911	224,946	232,265	255,785
Delaware	50,949	35,287	63,024	46,600
District of Columbia	83,155	75,684	84,260	94,183
Florida	310,457	330,285	522,465	315,214
Georgia	136,542	188,201	134,340	160,377
Hawaii	1,108	8,895	3,511	17,179
Idaho	31,846	44,589	24,959	34,221
Illinois	1,790,148	1,806,425	1,658,700	1,458,052
Indiana	690,624	694,894	625,962	646,062
Iowa	375,407	412,046	368,763	350,251
Kansas	254,074	260,169	205,607	226,069
Kentucky	220,859	174,283	196,628	246,310
Louisiana	105,440	121,260	80,907	108,642
Maine	37,277	108,161	40,051	90,934
Maryland	235,983	208,790	260,019	249,489
Massachusetts	356,341	349,319	326,615	358,853
Michigan	1,194,934	1,567,764	1,195,566	1,372,831
Minnesota	472,018	437,014	455,011	407,570
Mississippi	70,141	80,109	56,979	79,924
Missouri	723,916	611,020	597,568	457,632
Montana	31,638	31,256	24,598	30,597
Nebraska	210,305	201,211	206,703	169,159
Nevada	12,635	9,088	10,598	10,291
New Hampshire	52,941	49,958	48,675	56,092
New Jersey	653,685	691,453	809,251	866,717
New Mexico	17,246	21,231	12,945	17,738
New York	2,151,191	2,329,217	2,006,604	2,490,511
North Carolina	340,027	376,779	354,835	412,719
North Dakota	37,735	43,493	33,458	46,528
Ohio	1,212,138	1,199,908	1,118,150	1,137,722
Oklahoma	286,912	236,223	195,542	219,399
Oregon	157,360	128,525	157,333	150,679
Pennsylvania	1,852,731	1,493,733	1,937,173	1,620,018
Porto Rico	0	0	346	0
Rhode Island	71,369	66,573	71,846	56,575
South Carolina	92,255	62,408	82,742	55,967
South Dakota	57,380	44,054	56,838	47,794
Tennessee	193,279	207,528	171,080	239,051
Texas	404,161	484,822	328,962	430,727
Utah	45,985	54,276	44,564	56,948
Vermont	23,698	49,660	28,794	50,697
Virginia	176,842	182,011	184,071	191,720
Washington	323,325	198,993	258,182	202,117
West Virginia	177,994	162,440	201,698	188,894
Wisconsin	626,004	715,784	513,479	594,999
Wyoming	31,042	24,901	20,461	23,893
Unspecified	10,520	70,497	74,427	73,748
	18,258,726	18,465,336	17,610,869	18,032,122
Foreign countries	124,274	70,664	100,131	54,878
Total shipped from cement plants	18,383,000	18,536,000	17,711,000	18,087,000

*Includes estimated distribution of shipments from three plants in August and September, 1925; from four plants in August, 1926; and from five plants in September, 1926.

Production, shipments, and stocks of finished Portland cement by districts, in October, 1925 and 1926, and stocks in September, 1926, in barrels

Commercial Disrict	Production October 1925	Production October 1926	Shipments October 1925	Shipments October 1926	Stocks at end of Oct. 1925	Stocks at end of Oct. 1926	Stocks at end of Sept. 1926*
East. Pa., N. J., & Md.	3,851,000	3,986,000	4,108,000	4,272,000	802,000	2,432,000	2,718,000
New York	916,000	999,000	977,000	921,000	411,000	674,000	596,000
Ohio, West Pa., & W. Va.	1,700,000	1,795,000	1,432,000	1,668,000	1,515,000	2,057,000	1,930,000
Mich.	1,171,000	1,338,000	1,062,000	1,385,000	815,000	1,015,000	1,062,000
Wis., Ill., Ind., & Ky.	2,339,000	2,160,000	2,014,000	2,656,000	2,153,000	1,296,000	1,792,000
Va., Tenn., Ala., & Ga.	1,254,000	1,430,000	1,236,000	1,391,000	283,000	1,068,000	1,029,000
Eastern Mo., Ia., Minn. & S. D.	1,515,000	1,458,000	1,434,000	1,842,000	1,970,000	1,609,000	1,993,000
West. Mo., Neb., Kans. & Okla.	992,000	1,032,000	972,000	984,000	1,518,000	1,455,000	1,407,000
Texas	429,000	428,000	335,000	444,000	382,000	401,000	417,000
Col., Mont, & U.	270,000	275,000	200,000	252,000	487,000	406,000	384,000
California	1,189,000	1,381,000	1,201,000	1,359,000	458,000	480,000	458,000
Ore. & Wash.	366,000	314,000	338,000	312,000	185,000	412,000	409,000
	15,992,000	16,596,000	15,309,000	17,486,000	10,979,000	13,305,000	14,195,000

*Revised.

Estimated clinker (unground cement) at the mills at end of each month, 1925 and 1926, in barrels

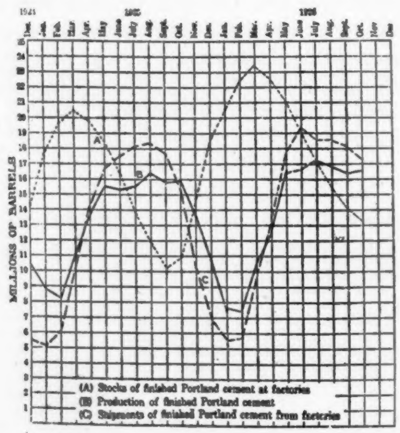
Month	1925	1926	Month	1925	1926
January	7,017,000	9,074,000	July	6,961,000	8,515,000
February	8,497,000	10,931,000	August	5,640,000	7,362,000
March	9,962,,000	12,284,000	September	4,561,000	*6,095,000
April	9,731,000	12,934,000	October	4,086,000	5,387,000
May	9,053,000	11,649,000	November	5,013,000	....
June	7,937,000	10,086,000	December	6,469,000	....

*Revised.

OCTOBER CEMENT STATISTICS

Production and shipments of Portland cement in October, 1926, were the greatest for that month in any year according to the Bureau of Mines, Department of Commerce. Production was at about the same rate as in September, 1926, and exceeded that of October, 1925, by nearly 4 per cent. While a seasonal decrease is shown in the October shipments of Portland cement they were over 14 per cent greater than the shipments in October, 1925. Portland cement stocks continued to decline but at the end of October, 1926, were over 21 per cent in excess of the stocks at the end of October, 1925.

These statistics, prepared by the Division of Mineral Resources and Statistics of the Bureau of Mines, are compiled from reports for October, 1926, received direct from all manufacturing plants except two, for which estimates were necessary on account of lack of returns.



The Harnischfeger Excavator

The Harnischfeger Corporation has just completed a bulletin covering their new and improved line of gasoline driven excavators, the "all cast steel" line. This bulletin, called 61-X, is a most complete book on excavating machinery, containing details of construction, from the ground up to the boom tip, attractively pictured and well described.

The application of P & H excavators in various fields such as highway work, building excavation, logging, quarries, brick and clay plants, railroads, etc., are illustrated. Draglines, shovels, cranes, clamshell cranes, skimmer scoops, pile drivers, trench hoes, trenching machines, backfillers, truck cranes—are all described. The complete specification of each machine is also included.

To the prospective purchaser this book will prove an advantage through its completeness in every detail.

Production, shipments, and stocks of finished Portland cement, by Months, in 1925 and 1926, in barrels

Month	Production 1925	Production 1926	Shipments 1925	Shipments 1926	Stocks at end of month 1925	Stocks at end of month 1926
January	8,856,000	7,887,000	5,162,000	5,674,000	17,656,000	20,582,000
February	8,255,000	7,731,000	6,015,000	5,820,000	19,689,000	22,384,000
March	11,034,000	10,355,000	10,279,000	9,539,000	20,469,000	23,200,000
1st quarter	28,145,000	25,973,000	21,456,000	21,033,000	....	....
April	13,807,000	12,401,000	14,394,000	12,961,000	19,877,000	22,640,000
May	15,503,000	16,472,000	16,735,000	17,951,000	18,440,000	21,173,000
June	15,387,000	16,827,000	17,501,000	19,113,000	16,409,000	18,900,000
2nd quarter	44,697,000	45,700,000	48,630,000	50,025,000	....	....
July	15,641,000	17,096,000	18,131,000	18,786,000	13,896,000	17,210,000
August	16,419,000	16,936,000	18,383,000	18,536,000	11,952,000	15,718,000
September	15,939,000	16,571,000	17,711,000	18,087,000	10,247,000	*14,195,000
3rd quarter	47,999,000	50,603,000	54,225,000	55,409,000	....	....
October	15,992,000	16,596,000	15,309,000	17,486,000	10,979,000	13,305,000
November	13,656,000	....	10,187,000	....	14,534,000	....
December	10,713,000	....	6,917,000	....	18,515,000	....
4th quarter	40,361,000	....	32,413,000	....	....	....
	161,202,000	....	156,724,000	....	....	....

EXPORTS AND IMPORTS*

Exports of hydraulic cement by countries, in September, 1926

Exported to—	Barrels	Value
Canada	1,167	$ 5,837
Central America	3,035	8,404
Cuba	5,502	13,568
Other West Indies	7,848	17,381
Mexico	10,662	31,599
South America	38,820	140,105
Other countries	3,886	22,280
	70,920	$239,174

Imports of hydraulic cement by countries, and by districts, in September, 1926

Imported from—	District into which imported—	Barrels	Value
Belgium	Galveston	5,892	$ 8,805
	Hawaii	18,540	24,514
	Los Angeles	11,605	14,634
	Maine and New Hampshire	9,008	8,400
	Massachusetts	48,308	68,940
	New York	36	150
	Oregon	5,951	8,426
	Philadelphia	47,605	101,267
	Porto Rico	3,986	7,206
	San Francisco	4,224	5,937
	South Carolina	3,003	4,216
	Washington	11,611	17,059
	Total	169,769	$269,554
Canada	Maine and New Hampshire	89	287
	St. Lawrence	3,068	6,091
	Total	3,157	6,378
Denmark and Faroe Islands	Porto Rico	9,848	15,425
	Washington	2,383	3,356
	Total	12,231	18,781
United Kingdom	Porto Rico	8,972	13,511
	Grand total	194,129	$308,224

Exports and Imports of hydraulic cement, by months, in 1925 and 1926

Month	Exports 1925 Barrels	Exports 1925 Value	Exports 1926 Barrels	Exports 1926 Value	Imports 1925 Barrels	Imports 1925 Value	Imports 1926 Barrels	Imports 1926 Value
January	71,596	$207,547	72,939	$216,431	231,258	$364,196	360,580	$576,717
February	56,249	181,356	73,975	220,706	119,077	206,308	314,118	527,948
March	65,248	200,410	69,080	205,647	218,048	337,039	493,241	812,968
April	89,508	263,831	96,296	284,772	197,686	280,826	257,302	398,114
May	85,385	250,845	78,601	224,365	186,897	286,959	223,130	337,031
June	71,343	217,899	80,684	248,814	254,937	409,539	335,570	495,744
July	98,141	286,543	130,822	370,220	335,118	499,602	250,862	395,981
August	103,961	289,904	64,946	216,489	379,847	611,551	350,638	560,532
September	102,649	285,225	70,920	239,174	513,252	789,121	194,129	308,224
October	73,369	228,467	......	....	535,050	824,268	......	....
November	101,825	294,201	......	....	388,604	678,518	......	....
December	100,323	296,900	......	....	295,543	526,001	......	....
	1,019,597	$3,003,128	......	....	3,655,317	$5,813,928	......	....

*Revised.

*Compiled from the records of the Bureau of Foreign and Domestic Commerce and subject to revision.

Cameron Centrifugal Pumps

The Ingersoll-Rand Company has recently issued a second edition of Bulletin Number 7059 describing the Cameron single stage, double suction, centrifugal pumps which it manufactures. These pumps are made in three classes known as LV, FV and HV.

These pumps are designed with the idea of simplicity and to use a minimum of parts, together with provision for easy access to interior members. Furthermore, the various parts used in their production have been standardized, with the exception of the impeller, so that the various units can be manufactured on a quantity basis. By this method shipments of repair parts can be made quickly upon receipt of order.

Each pump is given a running test duplicating field conditions, except in cases when liquids other than water are to be handled. In these tests capacity measurements are taken by means of a weir or nozzle, and power is measured by a torsion dynamometer, both of which have been carefully calibrated to secure accurate results. In addition to a running test, each pump is subjected to a hydrostatic test of 125 to 200 pounds per square inch, as the conditions require.

The class LV pumps are built in sizes from number 2, 100 g.p.m. to number 8, 2,500 g.p.m. and for head conditions up to 231 feet. Class FV pumps are large capacity, low head pumps for heads up to 175 feet. These are built in sizes from number 5,800 g.p.m. to number 48, which is capable of delivering 80,000 gallons per minute.

The class HV is a high-head volute pump and designed to cover higher heads than can be generated by class LV or FV pumps. This class is built in sizes from number 2, 100 g.p.m. to number 24, 30,000 g.p.m., being intended for heads from 175 feet to 300 feet, and for heads to 462 feet in series. All three types of pumps can be arranged for direct connection to motor, steam turbine, or gasoline engine.

Harrington with Blaw-Knox

Mr. E. LeRoy Harrington, well-known clamshell bucket engineer and designer, is now a member of the Blaw-Knox organization. His broad experience in designing buckets for ore, coal and slag handling installations will be used particularly in developing Blaw-Knox clamshell buckets for use in steel mills, blast furnaces; at ore and coal docks, and elsewhere, where clamshells must be carefully and particularly built to suit a special service.

How Sludge Accumulates in the Oil Pan

By G. S. Hamilton

Occasionally users of gasoline engines have been misled into thinking their oil, from its appearance on a bayonet gauge or otherwise, was in excellent shape because it appeared quite thick and rich. If at any time the oil in the crankcase gives the appearance of being heavier than when it was new, sludge formation may be expected.

Sludge is a mixture of water, oil, fuel and dust. It is a fact that clean oil and water will not mix permanently. Vinegar and salad oil will not mix, for instance, but the addition of the yolk of an egg, salt, pepper, etc., in proper proportions and in the right order, will produce mayonnaise—an excellent example of a very permanent and stiff emulsion.

If any sludge formations are found, it must be that water has found its way into the crankcase. Some slight amounts may enter by way of the breather pipe in the form of vapor, to be condensed against the cold metal. By far the greater amount, however, comes from the combustion chamber, in this way: Gasoline is a chemical combination of hydrogen (H) and carbon (C). Gasoline burns in air, and by "burning" we mean combining with oxygen (O). This, of course, constitutes about one-fifth of the air we breathe. The carbon in the gas unites with the oxygen to form CO_2, carbon dioxide—a gas which escapes out of the exhaust. But the hydrogen in the gasoline unites with the oxygen to form H_2O—water. Of course, this water is in the form of steam. But when the engine is cold, the metal parts, before they become heated, serve to condense this steam in the combustion chamber, in the form of minute drops which, under the action of the piston, are beaten up with the oil film on the cylinder walls and, as this film is being continually replaced with oil from the crankcase, soon the water laden oil is transferred to the crankcase, there to be whipped up with the oil supply by the action of the connecting rods. Sludge—thick, heavy, black and slimy—is the result. It may cause all sorts of trouble, particularly if the screen at the oil pump is small. If the screen has a fine mesh, the sludge will cover it, sometimes causing it to be broken by the vacuum created by the pump—or with less positive a pump system, the oil supply will be cut off, starving the bearings and causing them to burn out.

If sludge is suspected, have your oil pan dropped and thoroughly cleaned, as well as the accessible parts of the inside of the engine. A lintless cloth should be used for this purpose—never use water. A peculiarity of sludge is this; if it has once formed, the very small quantity allowed to remain will promote its further formation when fresh oil is added. The action seems to be, so to speak, infectious.

Variable-Voltage Equipment for Electric Power Shovels

Variable-voltage equipment has been designed by the Westinghouse Electric and Manufacturing Company for application to electric power shovels that eliminates rheostatic losses, thus keeping power costs low, increases the speed of operations and reduces operating expenses. This equipment is sturdy in its construction. It is particularly designed for the electric power shovels used in quarries, for handling road material and by cement manufacturers.

The motor-generator set used with this equipment consists of a driving motor and three direct-current generators, one for each of the shovel motors. The direct-current-type motors used with the variable voltage equipment are so constructed as to be able to stand up under shock and strain and have a high overload capacity. The motor is not injured by either starting or unusual overloads.

The control for the variable-voltage system is simple, but strongly constructed. Three drum controllers, one each for the swing, thrust and hoist motions, govern the speed and direction of rotation of the motors. These controllers handle only the field current of the various generators which is relatively small, thus eliminating arcing and burning the contacts. They have removable covers making them readily accessible.

The quick response of the motors to each movement of the controller handles, and the smooth, accurate control of the swing, hoist, and thrust motions gives flexibility and enables the operator to drive his machine at full speed continuously. Protection from dust and grit to all parts of the motors, and safety in operation are other features that make this variable-voltage equipment advantageous on electric power shovels.

The Mundy Sales Corporation announces that the George B. Curd Equipment Company, 609 Reading Road, Cincinnati, Ohio, with James D. Hughes as sales manager, has been appointed the exclusive distributor for Mundy Hoisting Equipment in southern Ohio, with exception of a few counties, also Eastern Kentucky, for contractors' equipment only.

Unnecessary Strength

The National Lime Association has recently published a very interesting bulletin, number 316, under the above title. In this book is noted the fact that steel construction of good design requires that available materials produce a structure of pleasing appearance, suitable arrangement and sufficient strength to carry the loads allowing a reasonable margin of safety.

The bulletin says that a similar policy should be followed in the building industry as there is no place where this fallacy of unnecessary strength runs to more foolish extremes than in mortar. Very little masonry is required to support more than its own weight as each individual member is designed for its own load. The entire load is carried on the steel frame. The walls and partitions of brick or tile are carried on steel work, floor by floor, and their load is less than one pound per square inch for each foot of height of the wall. Even on smaller apartment houses which seldom rise over five floors from the street, the load on lowest mortar joint is usually less than 100 pounds per square inch.

Then follow tables showing the difference in cost for the United States for the laying of bricks used in building if cement mortars, lime mortars or straight lime mortar were used. The argument is carried further by showing that an average workman man lay more bricks with lime mortar than with cement mortar, and records the saving to the industry in time by so doing.

The bulletin is very well written and contains a number of interesting figures and facts which are well worth the perusal of any one interested in the economical and practical aspect of the building industry.

Equipment Corporation Moves

The Equipment Corporation of America have removed their Philadelphia office to new quarters in a new building just being completed at 1601 Chestnut street, Philadelphia. With the additions to their already large plant which they have made this year, larger office facilities and organization, and increased stock, they are in better condition to take care of their rapidly growing business in the Philadelphia district. Mr. G .A. Whitehead and Mr. W. J. Comley continue in charge of this department.

Mr. Edward J. Costello, Jr. has joined the Blaw-Knox Company selling staff and will cover territory adjacent to the Philadelphia office.

Raymond Roller Mills

The Raymond Brothers Impact Pulverizer Company has recently issued catalog number 18, describing the Raymond roller mills with air separation. A complete Raymond system consists of a grinding mill or pulverizer, an air separator, an exhaust fan, a cyclone collector, a tubular dust collector (optional) and the necessary connecting pipes of blue annealed steel with welded seams. The roller mills and pulverizers are built especially for fine pulverizing, and designed for use in connection with air separation. By the use of the vacuum air separator, fineness of the finished product is at all times under the absolute control of the operator, and once adjusted, the system will deliver a uniform product as long as desired without further attention.

A unique and exclusive feature of these roller mills and pulverizers, which eliminates the human element with regard to maintaining capacity and uniform fineness of finished product, is the pneumatic feed control. This feature operates entirely by the change in vacuum in the machine. This in turn changes as the amount of material fed varies. The result is that a maximum capacity is produced regardless of the attention or inattention of the operator,

The manner in which these roller mills crush and pulverize material by gravity is briefly as follows: The material to be ground is fed to the mill from a storage bin through a spout. This spout delivers into an automatic feeding mechanism which delivers the material, in the proper quantities, to the grinding chamber. Here the material is caught by manganese steel plows and thrown up between rollers and a pulverizing or bull ring. One of these plows is located just ahead of each roller so that a constant stream is forced between the rolls and ring.

The separation of the finely ground material from the coarser particles is accomplished by the constant stream of air drawn through the mill by an exhaust fan. The stream of air enters the mill through a series of openings around the base of the grinding chamber and passes upward around the rollers and bull ring. In passing up the air carries with it the finely pulverized material from the grinding chamber into the separator. The coarse and heavier particles fall back and are thrown up by the plows to be reground until reduced to the desired fineness. No fine material remains in the grinding chamber to clog the mill and prevent continuous operation on coarse material.

These roller mills are built in several sizes; all sizes being identical in construction except for minor details, but varying in capacity. The sizes mostly specified are as follows: Five roller low-side, four roller low-side, five roller high-side, four roller high-side, three roller and two roller mills.

The low-side mills use a single cone separator and the greater bulk of materials pulverized are reduced to a fineness of about 95 per cent through 100 mesh screen. The high side mills are constructed somewhat differently from the low-side but use the same method of pulverizing. However, the high-side use a double cone separator and by this it is possible to produce a double separation obtaining a fineness of 99 per cent or better passing a 300 mesh screen. The principle on which the two and three roller mills operate is similar to the larger sizes already noted but the construction is somewhat different.

Morris Machine Works Issue New Catalog

The Morris Machine Works have recently issued bulletin 125 describing the sand and dredging pumps and hydraulic dredge machinery which they manufacture. This book is divided into sections as hydraulic dredging, sand and gravel production, hydraulic methods in mining, hydraulic conveying in industrial processes and power plants, etc.

In each of these sections the particular subject is discussed in a very practical manner, describing where this particular method was primarily used and where it can be employed to advantage. Illustrations of equipment being used on work of a similar nature to that noted in the section make the arguments not only more interesting but also conclusive. These illustrations in most cases give the size of apparatus being used and output which is being obtained.

The section on sand and gravel production is of exceptional interest, starting by stating a number of advantages which dredging pumps and hydraulic dredges have in the sand and gravel industry. Then follows typical installation not only in rivers and sand bars but also large plants using this method to obtain sand from a land bank by jetting the material into a sump and then using a dredging pump for elevating the mixture into a settling tank.

Some of the results obtained are well worth noting, such as: 60,000 cubic yards without a cent spent for repairs; 200 cars per day, and 31 cars loaded in 62 minutes; 2,000 tons per 10 hour day and 409 cubic yards of sand from 42 foot depth of water in an hour.

The bulletin states that the parts for these dredging pumps are produced interchangeably so that repair parts can be taken from stock ready for immediate shipment.

When manufacturing these pumps the parts undergo a series of rigid tests and after assembling, the casing is given a hydrostatic test to prove its strength against bursting or leakage. The efficiency and capacity of the completed pumping unit are then verified by tests that are equivalent to service conditions. A table accompanies the illustration of each pump and contains all the necessary data in order to order any equipment intelligently as regards capacity, size of driving pulley, revolutions per minute for various head lifts, etc.

Link-Belt Open Office In New Haven

The Link-Belt Company announce that it has opened a temporary office in New Haven at 152 Temple street. R. H. Hagner, formerly of the Philadelphia office, will have charge of this office and his efforts wil be devoted especially to the Link-Belt silent and roller chains section of this company's manufacture.

Miniature Boiler Exhibit

An attractive feature of the Diamond Power Specialty Corporation Exhibit at the New York Power Show, December 6th through 11th, will be a miniature boiler. By means of this boiler the principles of the correct application of soot blowers to varying boiler conditions will be demonstrated. The effects of soot deposits in retarding heat transmission, and the benefits of soot removal, will also be shown.

In addition to this working model, motion picture films showing the use and benefits of soot blowers on oil fired boilers, will be shown. These films, which were made by the United States Navy, are part of its training course in boiler room practice. Members of the Diamond organization in attendance at the show will include the following: Normal L. Snow, President; Willis P. Thomas, Secretary; George L. Davis, Assistant Sales Manager; Lynn W. Nones, Eastern Sales Manager; J. E. Heeter, Manager Philadelphia Office; R. L. Townsend, Manager Boston Office; H. D. Folinsbee, Jr., New York Marine Office; C. R. Vincent and H. W. Gilson, New York Representatives; and Robert June of Detroit, Director of Publicity.

Orton Model "V" ½ Yard Gasoline Shovel

The Orton Crane and Shovel Company has recently issued bulletin number 42 describing the ½ yard gasoline shovel, known as Model V, which this company manufactures.

Some of the interesting features which this shovel possesses are as follows: The clutch is power applied and does not require much manual labor for its operation. By simply setting a brake band the motive power engages the clutches. When it is desired to throw the clutches out of engagement, the brake is released and a powerful steel spring forces the clutches into neutral position. The operating lever for the clutches is provided with a spring shock absorber as another step in the direction of reducing manual labor. This shock absorber not only reduces the effect required to throw the levers but also allows the friction to engage evenly.

The hoisting mechanism is well designed and manufactured. The shovel has a separate clutch shaft for every operation; hoisting, crowding, swinging, booming, traveling and steering. Each operation can be performed independently and all can function simultaneously. Also the best material is used in its production, such as forged steel shafting, high grade steel castings and best quality phosphor-bronze bearings. Special attention has been given to accessibility of the shovel. Each power shaft can be removed independently of the others and any replacements may be made with a minimum amount of lost time.

The tread used on the shovel consists of a continuous chain of steel castings driven at one end by a sprocket with an idler wheel at the opposite end. Between the sprocket and idler wheel are a series of springs and rollers, each carrying two rollers in an equalizer. The rollers bear directly on the tread links and when traveling over uneven ground the springs compress and absorb shocks thus permitting the tread links to retain their bearings on the surface.

The general specifications of the shovel are: height from ground to top of cab, 10 feet, 6 inches; from center of rotation to rear of cab, 7 feet; width of treads, 7 feet, 6 inches; width of tread casting, 12 inches; operating weight, 27,000 pounds; length of boom, 16 feet; length of dipper, 12 feet, 6 inches; maximum working radius, 20 feet; minimum working radius, 8 feet; 4¾x5¾ four cylinder, gasoline motor, 53 horsepower; capacity of dipper, ½ cubic yard; traveling speed, 100 feet a minute; rotating speed, 5 rev. a minute; hoisting speed, 150 feet a minute.

Hercules Company Creates Development Department

The board of directors of the Hercules Powder Company has recently created a development department in charge of C. A. Higgins, with the title of manager. The function of this new department, which will report to the board of directors, will be, in general, to collect the facts and make recommendations on subjects principally of a general and economic nature, as are passed down by the board of directors for study. The new department will work in close coordination with the various managers on such problems as affect their respective departments.

Mr. Higgins is especially well fitted to conduct such a department for, with his knowledge of European conditions, his familiarity with the export and import trade, combined with his study of American business methods, a thorough understanding of development work has been gained.

C. A. Higgins

Recent Patents

The following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, Continental Trust Building, Washington, D. C., at the rate of 20 cents each. State number of patent and name of inventor when ordering.

1,603,520. Regulator for pulverizing-mills. Joe Crites, Evanston, and William H. Vogel, Highland Park, Ill., assignor to Raymond Bros. Impact Pulverizer Co., Chicago, Ill.

1,603,620. Concrete-mixer. Harold R. McDermott, Waterloo, Iowa, assignor to Construction Machinery Co.. same place.

1,603,765. Safety device for crushers. John S. Haas and Richard Bernhard, Allentown, Pa., assignor to Traylor Engineering & Mfg. Co., same place.

1,604,284. Clamshell-bucket. Edward L. Harrington, Erie, Pa., assignor to G. H. Williams Co., same place.

1,604,324. Vibrating screen. George M. Stedman, Aurora, Ind.

1,604,490. Screen. Elmer C. Shiley, Mount Union, Pa.

1,604,574. Quick-setting lime products. Major E. Holmes and Gail J. Fink, Washington, D. C., assignors to National Lime Association, same place.

1,604,575. Production of quick-setting lime products by the addition of carbonates. Major E. Holmes and Gail J. Fink, Washington, D. C., assignors to National Lime Association, same place.

1,604,576. Production by carbonation and the addition of sulphates of plastic materials having an initial quick set. Frank C. Mathers, Bloomington, Ind., and Russell L. Hardy, Woodville, Ohio, assignors to National Lime Association, Washington, D. C.

1,604,577. Quick-setting lime and process of making same. John W. Stockett, Jr., Washington, D. C., assignor to National Lime Association, same place.

1,604,639. Excavating machinery. John G. Fogarty, Rochester, N. Y.

1,604,701. Mining and loading apparatus. Nils D. Levin, Columbus, Ohio, assignor to Jeffrey Mfg. Co., same place.

1,604,896. Excavating apparatus. William E. Foltz, Detroit, Mich.

1,605,007. Conical crushing mill. Charles F. Smith and Harvey H. Rumpel, Milwaukee, Wis., assignors to Smith Engineering Works, same place.

1,605,012. Feed-spout for disc-crushers. Edgar B. Symons, Hollywood, Cal., assignor to Symons Bros. Co., Milwaukee, Wis.

1,605,050. Roll for gyratory mills. William T. McNinch, Chicago Heights, Ill., assignor to American Manganese Steel Co., Chicago, Ill.

1,605,181. Crusher and chain. Edward H. Frickey, St. Louis, Mo.

1,605,279. Method of calcining and clinkering cement-forming materials. Robert D. Pike, San Francisco, Cal.

1,605,969. Crusher. Benjamin J. Mitchell, New York, N. Y.

1,606,114. Gyratory crushing-machine. William S. Weston, Columbia, S. C.

1,606,125. Treating cement mix and other materials. John W. Hornsey, New York, N. Y., assignor to Granular Iron Co.

1,606,189. Paving construction. George B. Shaffer and William W. Lane, Phoenix, Ariz.

Mid-West Demonstrates

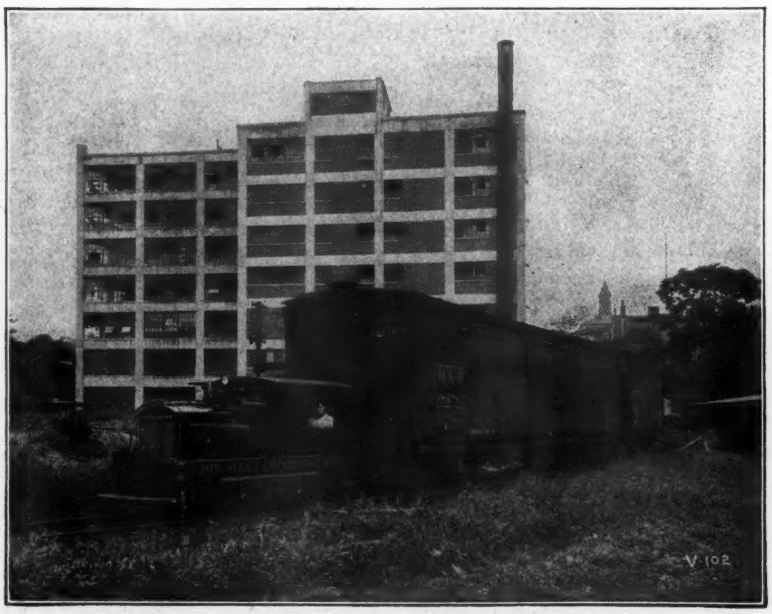
To show the feasibility and economy of, shippers and receivers of car-load freight, in all lines of business, doing a part of their own switching, so as to expedite loading or unloading, the Mid-West Locomotive Works, recently made a public demonstration of such switching with one of their new Model "80GD" 8 ton gasoline locomotives, built for standard gauge track, on sidings of the Baltimore and Ohio Railroad at Cincinnati.

The manufacturers report that they have for sometime realized that a great many concerns, handling car-load freight, did not realize that they could secure on a comparatively small investment a locomotive that would do the most of their switching, because they thought of the matter only in terms of the large railroad locomotive that has always done their switching. Hence the Mid-West Company decided to make a public demonstration, to show what could be done, to which the public were invited through newspaper notices. Representatives from a variety of industries turned out and generally were very much surprised to see what could be done by a small gasoline locomotive built for such service, particularly when it pulled three and four loaded cars through switches, around curves and up grades to loading platforms, or ten and twelve empties over rough uneven sidings with little effort.

It was readily shown that there are many situations, where such switching can be done at a cost of from $1.50 to $3.00 per day, depending upon amount of work done, this covering fuel, labor and interest on investment. Fuel and labor expense is small as it figures only for the time during which switching is done, because the operator can be employed otherwise when not switching. The direct and indirect savings are said to be sometimes as high as $25.00 to $50.00 per day.

The manufacturers also call attention to the advantages of gasoline power for such purposes because of freedom from smoke and fire hazard, which under some conditions is very important. Further the railroads welcome private switching as it is an expensive service for them.

These locomotives are provided with automatic couplers, foot boards and hand-holds, affording all the safety features used on railroad locomotives. For those who require a larger locomotive due to unusual grades, or for handling more cars, the manufacturers state they can furnish units weighing 10, 12, 16, 20 and up to 25 tons, and if desired equipped with air brakes.



The Mid-West Demonstration

Out of the Mud with Lime

The National Lime Asscoiation has recently issued bulletin 317 under the above title. This booklet deals with the subject of improving earth roads which feed the paved highways. The bulletin states that according to the "American Highway" issue of April, 1926, there are over two million miles of earth roads in the United States.

Two problems are involved in earth road construction and maintenance: one to prevent the road from becoming water-soaked and badly rutted, the other to restore it to good condition quickly and easily after a spell of wet weather. The booklet states that a practical and inexpensive solution of these problems has been found in lime treatment.

Tests were made in the field and in the laboratory over a period of two years, and the results are bringing the treatment to the attention of road builders because they indicate the solution to the problem in question. When hydrated lime is mixed with a top layer of soil in the road, the soil loses its stickiness and does not cling to the wheels of vehicles. Thus the addition of lime prevents ruts forming in the road.

The method employed to apply the hydrated lime will vary somewhat with the soil, the moisture conditions and the tools available. It is recommended that the best way is to plow the roadway to a depth of six inches, breaking about two inches at a time.

Sacks of lime should then be distributed along the road, the lime spread in a uniform layer and thoroughly disced into the loose soil. If the treatment is more than three inches deep it will be necessary to turn over the loose soil with a plow during the discing in order to mix the lime and soil thoroughly to the full depth of the treatment.

The bulletin has some interesting illustrations showing roads before and after treatment with lime. These illustrations show how deep ruts are formed by traffic on ordinary roads and how lime treated sections of roads obtain a smooth and wear resisting surface. Two tables are also given stating the correct amount of lime, in pounds, per square yard for various depths of treatment. The book is well prepared, interesting and valuable to all those who desire to obtain better and durable roads.

W. D. M. Allan Now Directs Concrete Products Work

Announcement has been made that W. D. M. Allan has been appointed manager of the Cement Products Bureau of the Portland Cement Association, effective November 1. He succeeds A. J. R. Curtis who becomes assistant to the general manager of the associaiton on the same date. Mr. Allan who is widely known in the building and cement products field has been engaged in the promotion of concrete products for the past seven years. Formerly he was a member of the Cement Products Bureau Staff, but more recently he served as office manager of the Illinois district office of the association.

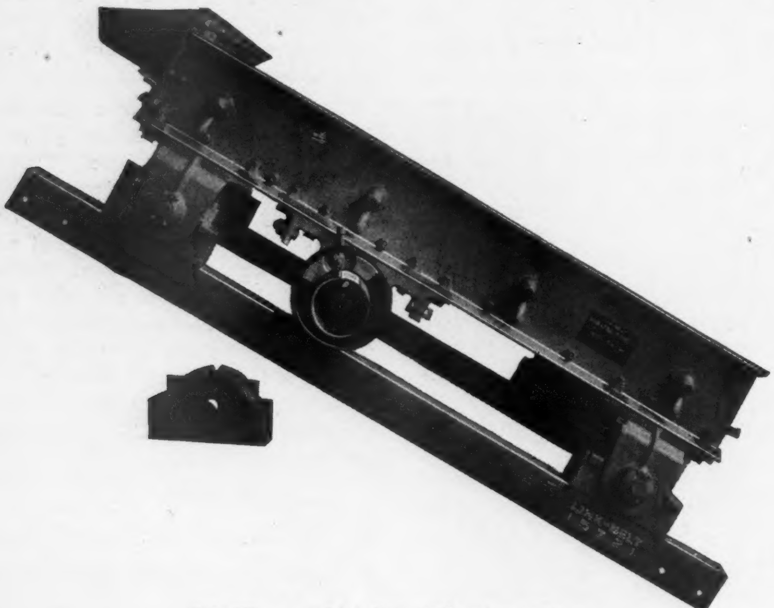
The Lincoln Steel Company announce that their general offices have been moved from 2320 West 58th Street, Chicago, to 229 West Illinois Street, where larger quarters are maintained with better facilities to attend to their increasing business.

New Link Belt Screen

The Link-Belt Company has recently developed the new ball bearing vibrating screen which is shown in the illustrations. This screen is simple in construction and requires, it is claimed, minimum upkeep expense and possesses adaptability to almost any fine screening condition.

This screen is a mechanically operated device, reduced to the simplest possible mechanism, viz., one moving part which rotates in large oversize ball bearings. The vibrator has no cams, springs, striking blocks or levers to adjust or renew. It simply consists of a shaft, driven at suitable speed from any common source of power. This shaft, thrown out of balance by adjustable counterweights, imparts vibrations to the screen box on which it is mounted, and these in turn, are transmitted to the screen cloth secured, under tension, in the box.

Link-Belt Vibrating Screen, Showing Method of Inserting Screen Cloth



Side View of Link-Belt Vibrating Screen

There are five standard sizes of screens, viz.: 2 feet x 5 feet, 3 feet x 5 feet, 4 feet x 5 feet, 3 feet x 8 feet and 4 feet x 8 feet, and each can be furnished with either one or two screening surfaces, giving a wide application for materials of varying size and capacities.

The screen cloth is placed upon the deck with its two longitudinal edges bent up. Binders are provided on the fine mesh cloths, for protection against tearing. Two flanged clamp plates engage these binders or the bent edges of the cloth; and by tightening the wing nuts on each side, the cloth can be quickly stretched to the desired tension.

These side clamp plates serve the four-fold purpose of stretching the screen cloth, clamping the cloth to its deck, eliminating wear of screen box side frames, and preventing leakage along side edges. A longitudinal vibrator strip assists the screening action by imparting raps to the cloth, thus minimizing wear and blinding. Binders are quickly detachable and can be re-used; and screen cloths, which are of standard width, can be obtained in rolls from the cloth manufacturers.

A feed hopper attached to the receiving end of screen box, vibrates with it, controls the feed, and uniformly spreads the material over the screening surface. For screening materials containing small particles, such as brick clay, etc., the vibrating feed hopper is fitted with a counterweighted feed gate.

This combination makes it easy to receive a non-uniform feed, and spreads the material over the width of screen cloth at just the right speed, moreover adding about 2 feet to the effective length of the screen, and obviating the use of mechanical distributors.

Inasmuch as successful screening depends upon the percentage of material brought into effective contact with the screen cloth and the ability to keep the meshes open; and, because the material must be kept in constant agitation, and the screen cloth itself constantly whipped to prevent clogging, it would seem that the newer type of vibrating screen, as exemplified by those screens embodying this ball bearing construction, should reach a widespread use.

General Electric Enclosed Fan-Cooled Motor

The General Electric Company has recently issued Circular GEA-517 describing the totally enclosed, fall-cooled D-C motors, type C D which it manufactures. In the design of these motors considerable thought has been given to the production of a motor which would give the greatest output in current with the least weight of machine. The result is a considerable reduction in first cost, greater economy in operation and interchangeability with open motors of corresponding ratings. The internal and external air currents are so controlled and directed as to most effectively radiate heat and eliminate hot spots.

The motors are equipped with ball bearings. In essential mounting dimensions, these motors are identical with the corresponding open frames with sleeve bearing construction. The motors are made in sizes from 2 to 2½ horse power either 230 or 530 volts and shunt and compound wound providing continuous duty at 55 degrees centigrade.